



Review of best practice for heavy vehicle telematics and other safety technology

Research paper
July 2018



National Transport Commission

Report outline

Title	Review of best practice for heavy vehicle telematics and other safety technology
Type of report	Research paper
Purpose	To investigate and make finding around current best practice and safety benefits of telematics and other safety technology.
Abstract	The report investigates the purpose, use and safety benefits of telematics and other safety technology, particularly in the areas of speed, fatigue and alcohol, the current use of technology by safer operators and how early adoption and uptake of such technology across the current and future heavy vehicle fleet can be encouraged.
Key words	Telematics, safety technology, heavy vehicle, Intelligent Access Program, IAP, Electronic Work Diary, EWD
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Executive summary

Context

Over the past 20 years, telematics and safety technologies have improved considerably and prevented or mitigated thousands of road fatalities and serious injuries. Many studies have reported an optimistic outlook on the safety benefits of emerging safety technology and telematics. Despite the advances in telematics and safety technology and the known benefits, the uptake and early adoption of the technology remains low.

In May 2018, the Transport and Infrastructure Council (the Council) approved the review of regulatory telematics report and associated recommendations. Subsequently, the Council asked the National Transport Commission (NTC) to undertake a review of best practice for heavy vehicle industry use of telematics and other safety technology (best practice review).

The best practice review has relied on desktop research and has been undertaken in consultation with government and industry stakeholders.

Scope

The NTC has performed a literature review to examine the current use of telematics and safety technology, and investigated the potential safety benefits of such technology, which include the prevention or mitigation of crashes resulting in fatalities and serious injuries.

The best practice review also investigated the current telematics, safety technology and processes used by safe operators.

Finally, the best practice review considered how early adoption and uptake of telematics and safety technology can be encouraged across the heavy vehicle fleet.

The best practice review makes 16 key findings.

Key findings

Effectiveness of telematics and other safety technologies in improving heavy vehicle safety

- **Finding 1:** as of July 2018, there were 4,817 restricted access vehicles enrolled in the Intelligent Access Program (IAP), representing around four and a half per cent of the heavy vehicle sector. Although the IAP has been in operation since 2009, the potential safety benefits of the technology have not been widely publicised.
- **Finding 2:** there is currently little evidence available around the safety benefits provided by an Electronic Work Diary (EWD) in Australia. The National Heavy Vehicle Regulator's Policy Framework anticipates that one of the outcomes of EWD operations will be improved safety through better reporting and monitoring.
- **Finding 3:** as interim On-Board Mass (OBM) is only being used in two jurisdictions (New South Wales and Queensland) there is limited information available on the potential safety benefits of this technology.
- **Finding 4:** research suggests that fatigue and drowsiness detection devices may prevent between four and 10 per cent of fatal crashes, reduce the severity of injuries and achieve cost savings up to \$28 million.
- **Finding 5:** research estimates that Electronic Stability Control (ESC) and Roll Stability Control (RSC) may prevent between four and 56 per cent of fatal crashes. A 2018 Regulation Impact Statement for improving the stability and control of heavy vehicles estimated that mandatory ESC and RSC would save 126 lives and reduce

the impact of road trauma on Australian communities by an estimated \$216 million. ESC has been mandated through Australian Design Rules for some vehicles.

- **Finding 6:** one study in Germany reported an eight per cent decline in rear-end collision rates after Emergency Brake Assist (EBA) became a standard feature in Mercedes-Benz vehicles. EBA has been mandated through Australian Design Rules for some vehicles.
- **Finding 7:** international and domestic research suggests that Autonomous Emergency Braking (AEB) may prevent between 20 and 50 per cent of crashes and reduce the severity of injuries.
- **Finding 8:** research has found that Forward Collision Warning Systems (FCWS) may prevent between 21 and 44 per cent of crashes and reduce the severity of injuries.
- **Finding 9:** several international and domestic studies have suggested that Lane Departure Warning Systems (LDWS) may prevent between four and 15 per cent of fatal crashes and reduce the severity of injuries.
- **Finding 10:** research estimates that Intelligent Speed Assistance (ISA) systems can further reduce heavy vehicle risks associated with speed and may prevent between 10 and 19 per cent of serious light and heavy vehicle crashes and injuries.
- **Finding 11:** research suggests that alcohol interlocks may prevent between five and 24 per cent of fatal heavy vehicle crashes and 11 per cent of injuries.

Safer operators use telematics and other safety technologies to track vehicles, to monitor speed, mass and driver fatigue and to inform targeted driver training programs

- **Finding 12:** a 2018 study conducted by Teletrac Navman reported that 89 per cent of respondents use telematics to monitor vehicle tracking, 67 per cent use telematics to monitor speed, 57 per cent to monitor distance travelled and 51 per cent to monitor driver hours.
- **Finding 13:** Many transport operators are increasingly adopting safety technologies and telematics to derive safety, productivity and commercial benefits. Safer operators are using telematics and safety technology in the following ways:
 - J.J. Richards and Sons use speed limiters on their entire heavy vehicle fleet, leading to shorter stopping distances and more time to identify and react to dangers ahead.
 - Linfox has partnered with Telstra and MTDData to implement an advanced telematics and management solution into its Australian truck fleet.
 - Rod Pilon Transport driver, Rod Hannifey, drives a TRUCKRIGHT Industry Vehicle (TIV), which aims to improve awareness and road safety. The TIV has Teletrac Navman telematics installed to allow Rod to operate under IAP.
 - Ron Finemore Transport has invested over \$1 million in the last two years in Seeing Machines technology. Ron Finemore Transport has also commenced a \$6.5 million Advanced Safe Truck Concept with Seeing Machines, Monash University, the Federal Government and Volvo, using Advanced Seeing Machines technology.
 - Simon National Carriers has developed its own in-vehicle telematics solution to meet the needs of the business. The telematics system records location, speed and self-declared mass and integrates business work and rest time management with payroll and their own freight management systems.

- Toll Group are currently undergoing a \$1.5 billion equipment upgrade, which include introducing a new fleet with the latest safety equipment and telematics on board. The managing director of Toll Group has issued a direction that every new vehicle purchased must have telematics.
- Wettenhalls has a positive safety culture and use telematics and safety technology such as adaptive cruise control, FCWS, ESC and LDWS in their fleet. Wettenhalls provide a dedicated driver training program to coach drivers and encourage safe driving.
- **Finding 14:** stakeholders advised that chain of responsibility has positively influenced some operators to make the right choices and ensure they can demonstrate compliance. Some industry stakeholders provided anecdotal evidence that some operators will not use vehicles if telematics devices are not fully functioning because of chain of responsibility duties.
- **Finding 15:** used effectively, telematics can positively influence drivers' behaviours, attitudes and the safety culture of an organisation. Telematics data reports can highlight trends in unsafe behaviours such as speeding and harsh braking, which can then inform data-based and targeted driver training programs.

Accelerating the uptake of telematics and other safety technologies through awareness campaigns, incentives, vehicle standards, government fleet and trials

- **Finding 16:** policy decisions made by government can influence the adoption of telematics and safety technologies. There are many mechanisms for accelerating the uptake and use of telematics and other safety technology, including: awareness campaigns about telematics and safety technologies, fast tracking the adoption of technologies into vehicle standards and Australian Design Rules, regulatory, financial and productivity incentives, updating government fleet and service contracts and heavy vehicle safety technology and telematics trials.

1 Context

Key points

In May 2018, the Transport and Infrastructure Council (the Council) approved the review of regulatory telematics report and associated recommendations. One of those recommendations included that the National Transport Commission (NTC) would undertake a heavy vehicle industry best practice review of telematics and other safety technology (best practice review).

The best practice review will consider whether telematics and other safety technologies are effective in improving heavy vehicle safety, the current use of technology by safer operators and how early adoption and uptake of such technology across the current and future heavy vehicle fleet can be encouraged.

1.1 Objectives

The heavy vehicle industry best practice review of telematics and other safety technology (best practice review) will build on the previous review of regulatory telematics work and inform future work undertaken by the National Transport Commission (NTC) in developing the Best Practice Model for Regulatory Telematics and assist states and territories in improving heavy vehicle safety.

The purpose of the best practice review is to improve safety and productivity outcomes for the heavy vehicle industry through increasing and improving industry use of telematics and other safety technology.

The best practice review will consider whether telematics and other safety technologies are effective in improving heavy vehicle safety, particularly in the areas of speed, fatigue and alcohol, the current use of technology by safer operators and how early adoption and uptake of such technology across the current and future heavy vehicle fleet can be encouraged. The best practice review is a research report and does not contain recommendations.

The best practice review has relied on desktop research and consultation with government and industry stakeholders to address three key questions. These include:

1. Are telematics and other safety technologies effective in improving heavy vehicle safety?
2. What telematics and other safety technologies do safer operators use?
3. How can the uptake of telematics and other safety technologies be increased?

The best practice review distinguishes between telematics applications and other safety technology. Telematics offer services for tolling, diagnostics, and commercial fleet tracking, including Electronic Work Diaries (EWDs), On-Board Mass (OBM), Intelligent Speed Compliance (ISC) and the Intelligent Access Program (IAP). Other safety technology includes in-vehicle technology used in light and heavy vehicles such as Electronic Stability Control (ESC), Emergency Brake Assist (EBA) and Forward Collision Warning Systems (FCWS). The best practice review does not include alternative forms of portable wireless communications, software as a service approaches and cloud and blockchain storage.

1.2 Background

1.2.1 Review of Regulatory Telematics

In September 2017, the Transport and Infrastructure Senior Officials' Committee (TISOC) asked the NTC to review the key policies governing the use and oversight of regulatory telematics. The NTC undertook the review of regulatory telematics in consultation with state/territory departments and road transport agencies, the road transport industry, police, the National Heavy Vehicle Regulator (NHVR), Transport Certification Australia (TCA) and technology providers.

In May 2018, the Transport and Infrastructure Council (the Council) approved the review of regulatory telematics report and recommendations. One of the recommendations included that the NTC would undertake a heavy vehicle industry best practice review of telematics and other safety technology. The other approved recommendations include:

1. TCA will examine the feasibility of improving the IAP.
2. The NTC will develop national guidelines to assist agency decision-making when assessing new IAP applications.
3. The NHVR will develop a compliance and enforcement policy for regulatory telematics.
4. The NHVR will monitor the implementation of electronic work diaries and report on their effectiveness.
5. The NTC, in consultation with relevant stakeholders, will develop a best practice model for regulatory telematics.
6. The NTC, in consultation with relevant stakeholders, will assess whether the best practice model should be legislated and included in the Heavy Vehicle National Law.

1.2.2 Telematics

Telematics relates to the exchange of data and information to and from a vehicle. Telematics are being used in the transport sector to optimise the efficiency of commercial operations by collecting diagnostic information about harsh braking, engine performance, routing, and to monitor drivers and the driving task. Telematics can also be used to underpin regulatory activities, such as granting network access and recording work and rest hours and OBM.

1.2.3 Heavy vehicle context

In July 2017, there were 98,108 articulated trucks registered in Australia, with an average age of 11.9 years, and 341,178 heavy rigid vehicles registered, with an average age of 15.7 years.¹ Due to the older age of the Australian truck fleet this means that a large proportion of the heavy vehicle fleet is unlikely to be equipped with the safety and intelligent transport systems available. However, some safety technology can be retrofitted to heavy vehicles.

During the 12 months to the end of March 2018, 184 people died from 163 fatal crashes involving heavy vehicles in Australia.² The Bureau of Infrastructure, Transport and Regional Economics (BITRE) reported a 1.8 per cent decrease in fatalities involving heavy vehicles with the corresponding period one year earlier.³ However, between 2016 and 2017 New

¹ Australian Bureau of Statistics, 2017, *Motor Vehicle Census Australia 31 Jan 2017*, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/9309.031%20Jan%202017?OpenDocument>.

² Bureau of Infrastructure, Transport and Regional Economics, 2018, *Fatal heavy vehicles crashes Australia quarterly bulletin*, https://bitre.gov.au/publications/ongoing/fhvc/files/Bulletin_Mar_2018_IV.pdf.

³ Ibid.

South Wales reported a 32 per cent increase in fatalities from heavy vehicle crashes, with the increase occurring largely on country roads.⁴

⁴ Transport for NSW, 2018, *NSW Government submission: Staysafe inquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/60327/Submission%2042.pdf>, p. 16.

2 Are telematics and other safety technologies effective in improving heavy vehicle safety?

Key points

Telematics and other safety technology have the potential to improve heavy vehicle safety. This section of the report will consider what current research suggests about the effectiveness of telematics and other key safety technologies in reducing crashes.

2.1 Overview

Telematics and other safety technology have the potential to improve heavy vehicle safety. There is a significant amount of literature on the benefits of in-vehicle safety technologies in preventing or mitigating crashes and reducing the severity of injuries. The heavy vehicle industry is adopting in-vehicle technology solutions to improve safety and there is optimism about the potential for existing and emerging safety technologies to further improve safety outcomes. Despite the widespread optimism and the known benefits about in-vehicle safety technology, the uptake and early adoption of the technology remains low.

There are two ways safety features can reduce the burden of injury associated with heavy vehicles. Firstly, primary safety features reduce the risk of a vehicle becoming involved in a crash. Secondly, safety technology can prevent injuries or reduce the severity of injuries when a crash occurs.

The use of heavy vehicle safety technologies can be categorised into four main areas:⁵

1. safety systems, technologies and vehicle types/combinations which prevent or reduce the likely incidence of crashes
2. safety systems or technologies which lessen the severity of a crash
3. safety systems or technologies which prevent or reduce the likely effects of driver fatigue and/or distraction
4. heavy vehicle maintenance and roadworthiness i.e. ensuring that a truck is maintained in a condition as recommended by the original equipment manufacturer so that all systems operate as intended.

This section of the report will consider what current research suggests about the effectiveness of telematics and other key safety technologies in reducing crashes.

The report will focus on the potential safety benefits of telematics applications including:

- Intelligent Access Program
- On-Board Mass
- Electronic Work Diary.

The report will focus on the potential safety benefits of other safety technology including:

⁵ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/Final%20Report.pdf>, p. 3.

- Fatigue and drowsiness detection devices
- Electronic Stability Control and Roll Stability Control
- Emergency Brake Assist
- Autonomous Emergency Braking
- Forward Collision Warning Systems
- Lane Departure Warning Systems
- Intelligent Speed Assistance and Intelligent Speed Compliance
- Adaptive cruise control
- Alcohol ignition interlock schemes.

2.2 Intelligent Access Program

Purpose

To monitor heavy vehicle access and assure road authorities that enrolled vehicles are complying with agreed conditions.

Applicable vehicle types

Heavy vehicles

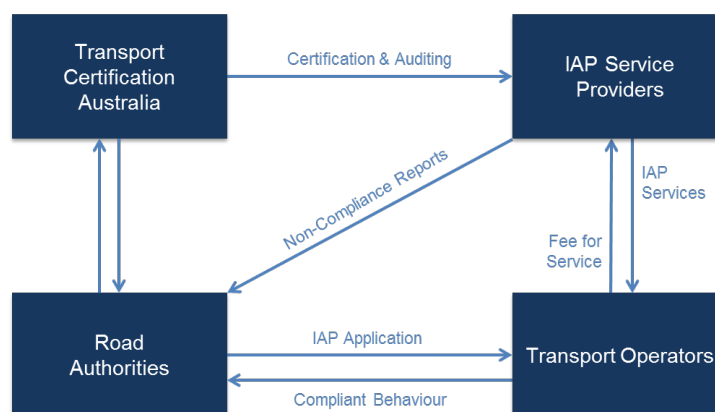
Mechanism

The IAP is an access and compliance management tool which uses Global Navigation Satellite Systems (GNSS) to manage road networks and infrastructure and assures road authorities that enrolled vehicles are complying with agreed conditions. The IAP is an application of the Heavy Vehicle National Law (HVNL) and can be used as a condition of access for certain vehicle types to monitor location, mass, speed and time of day. The types of data collected by the IAP are listed in Appendix A.

Enrolment in the IAP is currently a mandatory road condition for some higher mass limits, performance-based standards vehicles and oversize and overmass mobile cranes and concrete pump vehicles in Queensland, New South Wales and Victoria.

The IAP model is reflected in TCA's *National Telematics Framework*. The operating model of the IAP involves TCA managing the certification, type-approval and auditing of service providers, transport operators installing and using approved IAP devices, service providers undertaking monitoring of IAP data, and road transport authorities receiving non-conformance reports and following up on detected breaches.

Figure 1. Australian operating model for the Intelligent Access Program



In July 2018, there were 4,817 restricted access vehicles enrolled in the IAP, representing around four and a half per cent of the heavy vehicle sector.⁶ Between 2013 and 2017 enrolment in the IAP increased from 2,483 to 4,374, illustrating a growth rate of 76 per cent over a four-year period.

Safety benefits

Although the IAP has been in operation since 2009, the potential safety benefits of the technology have not been widely publicised. The NTC was unable to locate any further evidence that the IAP has led to improved safety outcomes.

As part of the recent NSW Inquiry into heavy vehicle safety and use of technology to improve road safety (the NSW Inquiry), Toll Group provided an example of data gathered by telematics being used to improve road safety.⁷ Mr Royce Christie, Group General Manager, Government Relations advised that Toll Group instituted a telematics and speed alert system that produces a back-to-base alert when a vehicle exceeds 100 kilometres per hour. Mr Christie reported that before installation of the telematics Toll Group was experiencing about 150 speeding events per month.⁸ However, in the three years from July 2012 to May 2015, there was a 75 per cent reduction in the number of speed alerts between 105 and 106 kilometres per hour.⁹ Mr Christie explained there was also a 60 per cent reduction in the number of speed alerts between 107 and 108 kilometres per hour, and no speed alerts for events greater than 110 kilometres per hour.¹⁰ Mr Christie advised the Staysafe Committee that:

*Monitoring, analysing, counselling, training, keeping the good drivers on who are willing to listen to the advice they are getting from the telematics boxes, and the advice that we are receiving, has led to a significant reduction in at least speeding alerts and we believe in a great improvement in safety overall.*¹¹

2.3 On-Board Mass

Purpose

To measure the mass of axle groups and calculate the gross vehicle mass of a vehicle.

Applicable vehicle types

Heavy vehicles

Mechanism

OBM Systems can measure the axle groups and calculate the gross vehicle mass of a vehicle. Approved OBM systems are linked to the IAP and allow road managers to grant access to routes approved as suitable that may have previously been unavailable for these vehicle types due to identified infrastructure risks.

OBM has not yet been broadly adopted as a condition of access for regulatory telematics. Transport operators have adopted OBM Systems as a technology-based strategy to better manage commercial obligations, mass compliance and chain of responsibility

⁶ Transport Certification Australia, 2018, *Record growth in the Intelligent Access Program (IAP)*, media release, https://tca.gov.au/documents/2018_07_18_TCAMedia-RecordIAPGrowth.pdf.

⁷ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Report on proceedings before Staysafe Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/transcripts/285/Corrected%20%20Transcript%20-%209%20April%202018.pdf>, p. 36.

⁸ Ibid.

⁹ Ibid.

¹⁰ Ibid.

¹¹ Ibid.

requirements.¹² TCA has developed an OBM Systems Functional and Technical Specification for service providers and transport operators and will link location, speed, time, vehicle configuration and mass data through a single service.¹³ As the Specification forms part of TCA's *National Telematics Framework*, there will be technical, functional, legal and commercial interoperability between the OBM Program and all other programs. The types of data collected by OBM systems are listed in Appendix A.

OBM is not mandatory in heavy vehicles.

Figure 2. Example of On-Board Mass system



TCA has reported that 290 vehicles are being monitored for OBM, indicating a 53 per cent increase in uptake since June 2016.¹⁴

Safety benefits

As interim OBM is only being used in two jurisdictions (New South Wales and Queensland) there is limited information available on the potential safety benefits of this technology.

Teletrac Navman, a certified OBM provider, states that some of the benefits include:¹⁵

- Up to a 50 per cent reduction in number of trips for the same freight task
- More than 40 per cent savings in fuel and reduction in greenhouse gas emissions
- Improved safety due to fewer trucks on the road.

2.4 Electronic Work Diary

Purpose

To record work and rest times for fatigue-regulated heavy vehicle drivers.

Applicable vehicle types

Fatigue-regulated heavy vehicles

Mechanism

The EWD is any electronic recording system that can record work and rest times and may be used as a voluntary alternative to the written work diary for fatigue-regulated heavy vehicle drivers. The EWD provides evidence that a driver's work hours are compliant with the fatigue management requirements under the HVNL. The policy intent of record-keeping requirements is to improve road safety by increasing visibility of driver activity and to reduce opportunities for driving while impaired by fatigue. The NHVR has responsibility for

¹² Transport Certification Australia, 2017, *On-Board Mass (OBM) Systems*, <https://tca.gov.au/truck/obms-ta>.

¹³ Transport Certification Australia, 2017, *OBM System Functional and Technical Specification*, <https://tca.gov.au/nf/specifications/obm-spec>.

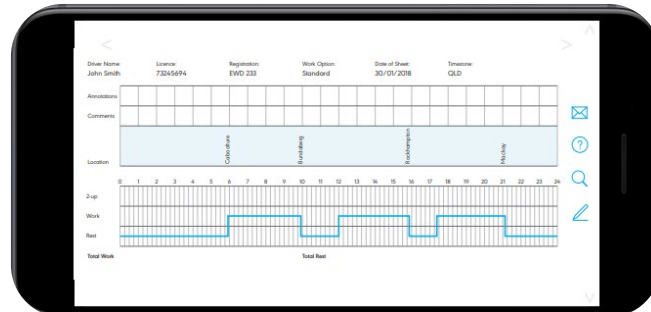
¹⁴ Transport Certification Australia, 2017, *Annual Report 2016-17*, p. 11, http://tca.gov.au/documents/2016-17_TCA_Annual-Report.pdf.

¹⁵ Teletrac Navman, no date, *Interim On-Board Mass Program*, <http://www.transtech.net.au/solutions/onboard-mass>.

implementation of the EWD and approval of EWDs. The NHVR is planning to commence EWD operations in late 2018.

EWDs are not mandatory in heavy vehicles.

Figure 3. Example of an Electronic Work Diary in compliance view¹⁶



Since December 2017, all commercial drivers in the United States who are required to prepare hours-of-service records must use an Electronic Logging Device (ELD) to record hours of work and rest. An ELD is a device that automatically records date, time, location information, vehicle miles, vehicle and driver identification, authenticated user and the motor carrier. ELDs are not required to collect data on vehicle speed, braking action, steering function or other vehicle performance parameters. ELDs are only required to collect data to determine compliance with hours of service regulations. The ELD is different to the EWD model and system used in Australia.

Safety benefits

As the EWD is not currently operational, there is little evidence available to show potential quantifiable safety benefits provided by the system.

In 2013, the Operational Pilot of Electronic Work Diaries and Speed Monitoring Systems Final Report anticipated that the introduction of EWDs would make a positive contribution to fatigue management, and potentially lead to fewer fatigued heavy vehicle drivers on the Australian road network.¹⁷ The EWD pilot outlined that a one per cent in reduction of fatalities on 2012 information could lead to a \$15.68 million net cost benefit.¹⁸ The EWD pilot advised that the introduction of EWDs when compared to written work diaries, even at the lowest levels of take-up (one per cent), showed a net cost benefit of \$7.5 million over five years.¹⁹ However, the NHVR advised that the assumptions around outcomes and uses contained in the EWD pilot are different to the agreed EWD model and should not be relied upon to demonstrate safety benefits.

The NHVR's Policy Framework anticipates that one of the outcomes of EWD operations will be improved safety through better reporting and monitoring.²⁰ The NHVR advised that reliable reporting and monitoring of work and rest is essential in effective fatigue risk management systems and consequently to safety outcomes.²¹

The regulatory impact analysis undertaken by the United States Federal Motor Carrier Safety Administration when mandating the ELD estimated that ELDs would prevent 1,844

¹⁶ National Heavy Vehicle Regulator, 2018, *Your Electronic Work Diary*, <https://www.nhvr.gov.au/files/201803-0776-ewd-brochure.pdf>.

¹⁷ Transport for NSW, 2013, *Operational Pilot of Electronic Work Diaries and Speed Monitoring Systems*, Final Report, http://roadsafety.transport.nsw.gov.au/downloads/electronic_work_diaries_oct2013.pdf, p. 5.

¹⁸ Ibid., p. 93.

¹⁹ Ibid., p. 97.

²⁰ National Heavy Vehicle Regulator, 2018, *EWD Policy Framework*, <https://www.nhvr.gov.au/files/201805-0815-ewd-policy-framework.pdf>, p. 40.

²¹ Ibid.

crashes, 562 injuries and save 26 lives each year.²² However, the NHVR advised that as the ELD uses vehicle-based recording and a different policy framework, comparisons between the EWD and ELD should not be made.

2.5 Fatigue and drowsiness detection devices

Purpose

To detect excessive driver fatigue levels and alert the driver so that a crash does not occur.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Fatigue and drowsiness detection devices are considered 'other safety technology' and monitor and assess a driver's level of alertness and gives warning when this is determined to have degraded beyond a threshold. Whilst fatigue itself is hard to measure, technology can monitor eyelid movements of a driver, monitor and assess steering wheel movements and speed of steering movements, to calculate an approximate level of driver fatigue.

Fatigue and drowsiness detection devices may involve an infra-red camera and image processing technology to measure the duration of retina visibility over a given period. This information is used to calculate an approximate level of fatigue, which is initially communicated to the driver on a visual basis (generally a series of lights mounted on the dashboard). Once the observed retina coverage reaches a certain level, an audible warning is triggered, alerting the driver and prompting them to stop for rest. These systems can also allow a fleet supervisor to undertake real-time monitoring of the driver's performance and condition.

During the NSW Inquiry some industry members provided strong support for fatigue eye detection software to manage fatigue.²³ The NHVR advised that although fatigue monitoring is becoming more reliable, industry take-up of such technologies is inconsistent, particularly due to cost.²⁴ Nevertheless, the NHVR advised that driver behaviour monitoring devices, in association with broader risk management, provide the greatest opportunity to mitigate fatigue and improve road safety.

Western Australia noted they have received feedback from larger operators that the most effective systems are the ones with cameras mounted in the truck cab. These systems also monitor driver distraction, such as when a driver looks at a mobile phone.

Fatigue and drowsiness detection devices are not mandatory in light and heavy vehicles. However, action 9 of the National Road Safety Strategy Action Plan 2018-2020 states that governments will increase the market uptake of safer new and used vehicles and emerging vehicle technologies with high safety benefits, including fatigue and drowsiness detection devices.²⁵

There are several fatigue and drowsiness detection devices available for use in heavy vehicles, including Optalert, Seeing Machines and SmartCap.

²² Federal Motor Carrier Safety Administration, 2015, *Electronic Logging Devices and Hours of Service Supporting Documents – Final Rule*, <https://www.gpo.gov/fdsys/pkg/FR-2015-12-16/pdf/2015-31336.pdf>, p. 78294.

²³ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/Final%20Report.pdf>, p. 14.

²⁴ Ibid.

²⁵ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 10.

Optalert

Optalert technology continually measures driver drowsiness using a system of infrared reflectance oculography housed in a pair of glasses.²⁶ The glasses emit and detect low levels of infrared light to sense movements in the eyes and eyelids. These movements are measured using the Johns Drowsiness Scale. The scale provides a real-time measure (from 0.0 to 9.9) of the subject's drowsiness level and notifies the driver when their level of alertness shows a risk. The driver's fatigue score is constantly shown on a small dashboard-mounted display unit and the driver is alerted by audible and visual warnings when their score exceeds a predetermined threshold. The first warning is emitted when the driver reaches four and a half on the scale, which is equivalent to a 0.05 blood alcohol content.²⁷ The data captured by the glasses is shared with the transport operator, assisting in determining the nature and size of their fatigue risk. The system costs approximately \$3,000 plus daily reporting costs.²⁸

Figure 4. Optalert drowsiness detection glasses and eagle detection systems²⁹



Seeing Machines

Seeing Machines has developed technology to interpret the human face and eyes to detect the symptoms of fatigue.³⁰ Seeing Machines' technology uses two cameras placed on the cabin of a truck, plane or train, which are pointed at the driver or pilot. The cameras measure the drivers' head pose and orientation, their eyelid closures, pupil diameter and direction of their gaze. This information is analysed to determine whether the driver is alert, drowsy or inattentive. If a driver is found to be drowsy or distracted, the driver's seat vibrates, and an alarm sounds to wake them up. Real-time event notices can also be conveyed to a fleet supervisor. The system costs approximately \$17,000 plus daily reporting costs.³¹

²⁶ Optalert, 2017, *Why Optalert*, <http://www.optalert.com/it-works>.

²⁷ Catalyst, 2011, *Optalert*, <http://www.abc.net.au/catalyst/stories/3280461.htm>.

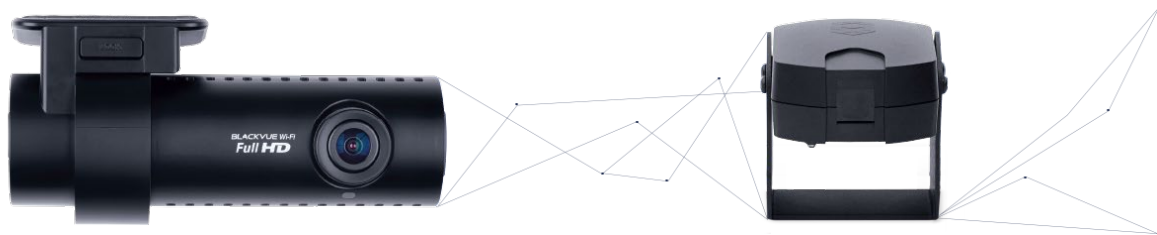
²⁸ Transport for NSW, 2018, *NSW Government submission: Staysafe inquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/60327/Submission%2042.pdf>, p. 59.

²⁹ Stewart, J, 2015, *Evolving technology in transport and logistics*, <https://www.tradetrucks.com.au/product-news/1508/evolving-technology-in-transport-and-logistics>.

³⁰ Seeing Machines, 2017, *Industry Applications Fleet*, <https://www.seeingmachines.com/industry-applications/fleet-guardian/>.

³¹ Transport for NSW, 2018, *NSW Government submission: Staysafe inquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/60327/Submission%2042.pdf>, p. 59.

Figure 5. Seeing Machines technology³²



SmartCap

The SmartCap is a system that measures an individual's ability to resist sleep through using electroencephalography (EEG).³³ The SmartCap measures brain activity through a sensor embedded in a baseball cap (or head band or beanie) and calculates the driver's level of drowsiness and wirelessly displays the value on a small dashboard-mounted display unit. The system emits visual and audible alerts to the driver when a fatigue threshold is exceeded.

Figure 6. SmartCap technology³⁴



Safety benefits

National Transport Insurance (NTI) reported fatigue was a factor in 12.2 per cent of accidents.³⁵ NTI stated that 82 per cent of major crash incidents attributed to fatigue occurred in the eastern Australian states, with 86.8 per cent of these losses occurring on the designated highway network.³⁶ NTI research indicates the across all fatigue related events, 68.9 per cent occurred on outbound journeys from home base, with 58 per cent of those losses occurring within 500 kilometres from the point of departure.³⁷

Research has suggested that fatigue warning systems may prevent between four and 10 per cent of fatal crashes, reduce the severity of injuries and achieve cost savings up to \$28 million.

³² Seeing Machines, no date, *Seeing Machines Products*, <http://www.seeingmachines.co.za/products.aspx>.

³³ Smart Cap, 2018, *FAQ*, <http://www.smartcaptech.com/faq/>.

³⁴ SmartCap, 2018, *Our Product*, <http://www.smartcaptech.com/life-smart-cap/>.

³⁵ National Transport Insurance, 2017, *2017 Major Accident Investigation Report*, http://www.nti.com.au/files/files/20147_NTARC_Report/C666_NTI_2017_Accident_Investigation_Report_LR_2.pdf, p. 7.

³⁶ *Ibid.*, p. 30.

³⁷ *Ibid.*

In 2008, research by Searson et al. suggested that fatigue warning systems in light vehicles may lead to a 10 per cent reduction in crashes and a trauma reduction of two per cent.³⁸

In 2014, an Australian study by Budd and Newstead estimated that savings to society from the mandating of fatigue warning systems in heavy vehicles was \$28 million for fatal and \$19 million for serious injury crashes.³⁹

In 2017, Transport for NSW estimated that the use of fatigue warning systems in heavy vehicles could prevent around four per cent of fatal heavy vehicle crashes.⁴⁰

2.6 Electronic Stability Control and Roll Stability Control

Purpose

To reduce the incidence of heavy vehicle loss-of-control and rollover crashes.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Electronic Stability Control (ESC) and Roll Stability Control (RSC) are considered 'other safety technology' and are two stability systems designed to mitigate roll-over and loss of control crashes in heavy vehicles. Stability control systems include sensors that monitor vehicle dynamics and estimate the stability of a vehicle based on its mass and velocity. The technology works in the background and will automatically de-throttle the engine and initiate braking without driver involvement when the system detects loss of control or vehicle over-speed in a curve. RSC systems address roll instability, while ESC systems address both roll and yaw instability (loss of vehicle directional control).

Figure 7. Electronic Stability Control system⁴¹

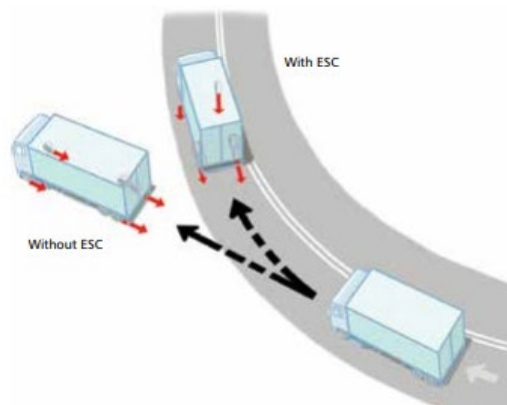
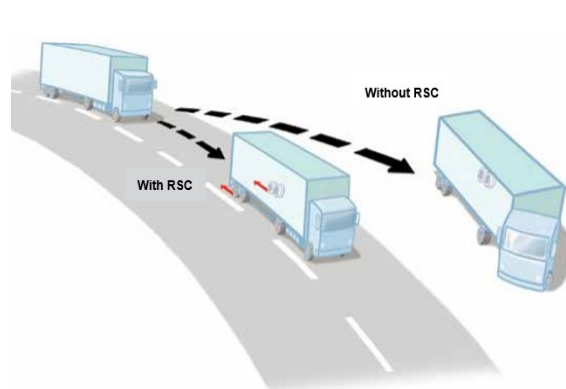


Figure 8. Roll Stability Control system⁴²



³⁸ Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits: Discussion of expert opinions*, Centre for Automotive Safety Research, The University of Adelaide, <http://acrs.org.au/files/papers/arcs/2015/SearsonD%20054%20Emerging%20vehicle%20safety%20technologies%20and%20th eir%20potential%20benefits.pdf>, p. 2.

³⁹ Budd, L & Newstead, S, 2014, *Potential safety benefits of emerging crash avoidance technologies in Australasian heavy vehicles*, Report, https://www.monash.edu/_data/assets/pdf_file/0003/216489/muarc324.pdf, p. 68.

⁴⁰ Transport for NSW, 2017, *Safety technologies for heavy vehicles and combinations*, <http://roadsafety.transport.nsw.gov.au/downloads/safety-technologies-heavy-vehicles.pdf>, p. 7.

⁴¹ Ibid, p. 2.

⁴² Ibid, p. 3.

The heavy vehicle industry advised that the fitting of ESC has increased to around 25 per cent of new trucks and 40 per cent of trailers in Australia.⁴³ These figures are much lower than in Europe where fitment of these systems is mandatory for all new heavy vehicles (subject to some limited exemptions).

Western Australia also noted ESC and RSC systems have been challenging for longer road trains, e.g. quad road trains, due to voltage drop and the number of modules that can be fitted to one vehicle combination. However, some manufacturers have found solutions to address these challenges.

In 2014, the New South Wales Environment Protection Authority made a determination for all existing dangerous goods tank trailers travelling on roads in New South Wales to be fitted with roll-over control by 1 January 2019 to reduce the risk of vehicle rollover.⁴⁴ The determination was made in response to several fatal fuel collisions in New South Wales.⁴⁵

ESC has been mandated through Australian Design Rules (ADR) for the following vehicle types:

- passenger cars, forward-control passenger vehicle and off-road passenger vehicle from November 2011 (for new models) and November 2013 (for all vehicles)
- light goods vehicles from November 2015 (for new models) and November 2017 (for all vehicles)
- heavy omnibus from November 2020 (for new models) and from January 2022 (for all vehicles)
- heavy goods vehicle from November 2010 (for new models) and January 2022 (for all vehicles)
- heavy trailer from July 2019 (for new models) and November 2019 (for all vehicles).

The Commonwealth Department of Infrastructure, Regional Development and Cities has recently completed a Regulation Impact Statement to examine the case for mandating ESC for heavy trucks and buses and RSC for heavy trailers, through ADR. The Commonwealth Department of Infrastructure, Regional Development and Cities recently announced that ADR will mandate ESC for new heavy vehicle trailers from July 2019 and for selected new heavy trucks and buses from November 2020.⁴⁶ The Hon. Paul Fletcher, Minister for Urban Infrastructure and Cities announced that this regulatory change will:

*bring the same life-saving technology to Australia as is currently required in Europe, the US and other markets... These changes will greatly improve safety for all motorists and reduce the impact of road trauma on Australian communities by an estimated \$216 million.*⁴⁷

Safety benefits

Research has suggested that ESC and RSC may prevent between four and 56 per cent of fatal crashes.

A 2014, an Australian study by Budd and Newstead advised that both ESC and RSC have been found to be effective at reducing heavy vehicle rollover events resulting from tight

⁴³ National Road Transport Association, 2018, *Staysafe Committee Inquiry into heavy vehicle safety and use of technology to improve road safety*, submission, <https://www.parliament.nsw.gov.au/ladocs/submissions/59783/Submission%203.PDF>, p. 5.

⁴⁴ NSW Environmental Protection Authority, 2014, *EPA puts trucking companies on notice*, media release, <https://www.epa.nsw.gov.au/news/media-releases/2014/epamedia14090501>.

⁴⁵ Ibid.

⁴⁶ Fletcher, P (Minister for Urban Infrastructure and Cities), 2018, *New heavy vehicle brake standards will save lives*, media release, http://minister.infrastructure.gov.au/pf/releases/2018/june/pf056_2018.aspx.

⁴⁷ Ibid.

curve negotiating.⁴⁸ The study estimated that four per cent of all heavy vehicle fatal crashes could be prevented through the mandating of ESC systems, translating to an annual saving to Australian society of \$31 million.⁴⁹

In 2015, the United States National Highway Traffic Safety Administration (NHTSA) indicated that ESC for heavy vehicles is 40 to 56 per cent effective in reducing rollover crashes and 14 per cent effective in reducing loss of control crashes.⁵⁰ The NHTSA also estimated that RSC for heavy vehicles is 37 to 53 per cent effective in reducing rollover crashes and two per cent effective in reducing loss of control crashes.⁵¹ Earlier research by the NHTSA suggested a 31 and 42 per cent reduction in injury for RSC and ESC respectively, and a 42 and 49 per cent reduction in fatalities for RSC and ESC respectively.⁵²

The 2018 Regulation Impact Statement for improving the stability and control of heavy vehicles estimated that mandatory ESC and RSC would save 126 lives and reduce the number of serious injuries by more than 1,000 over the period of regulation.⁵³

2.7 Emergency Brake Assist

Purpose

To reduce the stopping distance of a vehicle in an emergency braking situation.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Emergency Brake Assist (EBA) are considered 'other safety technology' and use a sensor attached to the braking system to detect pedal pressure beyond a pre-set threshold and determines that the vehicle is undergoing emergency braking. The system then applies maximum braking force to the vehicle. As a result, the stopping distance is minimised, either reducing or avoiding potential impact.

EBA has been mandated through ADR for the following vehicle types:

- passenger cars, forward-control passenger vehicle and off-road passenger vehicle from November 2015 (for new models) and November 2016 (for all vehicles)
- light goods vehicles from November 2015 (for new models) and November 2017 (for all vehicles).

⁴⁸ Budd, L & Newstead, S, 2014, *Potential safety benefits of emerging crash avoidance technologies in Australasian heavy vehicles*, Report, https://www.monash.edu/_data/assets/pdf_file/0003/216489/muarc324.pdf, p. 10.

⁴⁹ Ibid, p. 68.

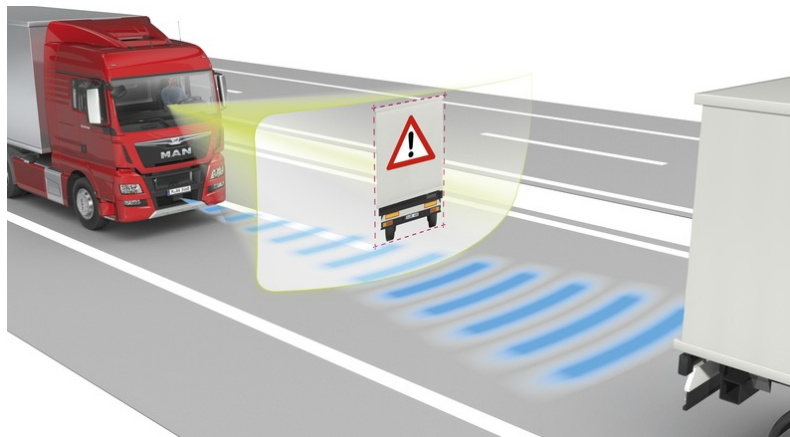
⁵⁰ Department of Infrastructure, Regional Development and Cities, 2018, *Regulation Impact Statement: Heavy vehicle braking strategy phase II – improving the stability and control of heavy vehicles*, <https://www.legislation.gov.au/Details/F2018L00664/a4847068-acdd-40ee-b1dc-8fac8bcbcf8>, p. 18.

⁵¹ Ibid.

⁵² Anderson, R.W.G, Hutchinson, T.P, Linke, B.J, & Ponte, G, 2011, *Analysis of crash data to estimate the benefits of emerging vehicle technology*, Centre for Automotive Safety Research, University of Adelaide, <https://www2.ewu.edu/Documents/cbpa/nwttap/newsletter/publications/casr094.pdf>, p. 11.

⁵³ Fletcher, P (Minister for Urban Infrastructure and Cities), 2018, *New heavy vehicle brake standards will save lives*, media release, http://minister.infrastructure.gov.au/pf/releases/2018/june/pf056_2018.aspx.

Figure 9. Emergency Brake Assist⁵⁴



Safety benefits

An analysis of Mercedes-Benz in Germany reported an eight per cent decline in rear-end collision rates for light vehicles after EBA became a standard feature.⁵⁵

2.8 Autonomous Emergency Braking

Purpose

To detect an obstacle in the vehicle's path and, without intervention by the driver apply the braking system.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Autonomous Emergency Braking (AEB) are considered 'other safety technology' and refer to the vehicle detecting an obstacle in its path and braking without any intervention by the driver. These obstacles may include pedestrians and cyclists, so AEB is a technology that has the potential to prevent injury to both vehicle occupants and vulnerable road users. The technology uses smart cameras, radar or light detection and ranging detectors, which cannot be retrofitted.

AEB is not mandatory in light and heavy vehicles. However, action 4 of the National Road Safety Strategy Action Plan 2018-2020 states that governments will increase deployment of AEB in both heavy and light vehicles through ADR.⁵⁶ By 2020, governments would like the majority of consumers purchasing vehicles fitted with AEB, through mandating AEB in heavy and light vehicles, as well as increasing voluntary uptake.⁵⁷

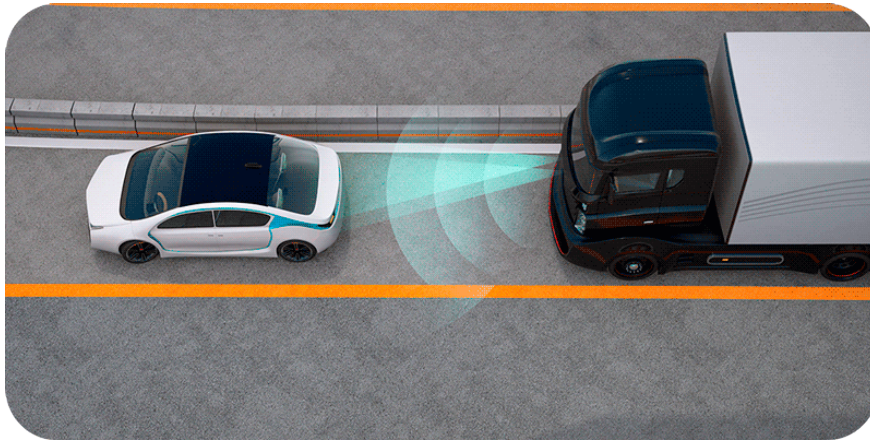
⁵⁴ Safe Car News, 2015, *MAN Truck releases next gen emergency braking system*, http://safecarnews.com/man-truck-releases-next-gen-emergency-braking-system_ay6131/.

⁵⁵ Farmer, C.M, 2008, *Crash avoidance potential of five vehicle technologies*, Insurance Institute for Highway Safety, <http://www.iihs.org/frontend/iihs/documents/masterfiledocs.ashx?id=1826>, p. 2.

⁵⁶ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 7.

⁵⁷ Ibid.

Figure 10. Autonomous Emergency Braking⁵⁸



Studies have expressed a distinction between low speed AEB, that may be effective at reducing the number of crashes and injuries in a city environment, and high speed AEB, which may reduce impact speed in higher speed environments.⁵⁹

Recent market analysis by independent vehicle safety authority, the Australasian New Car Assessment Program (ANCAP), revealed AEB across the Australian light vehicle market has increased from three per cent to 31 per cent since December 2015.⁶⁰ ANCAP reported that of the top 100 selling vehicles in March 2018, 37 models representing 31 per cent of the market offered AEB as standard.⁶¹ The ANCAP report found that the Australian Capital Territory and Victoria hold the greatest market share of vehicles with AEB standard (34 per cent).⁶²

Safety benefits

International and domestic research suggests that AEB may prevent between 20 and 50 per cent of crashes and reduce the severity of injuries.

A 2008 study by Farmer analysed United States crash data and found that AEB was the most promising of five different emerging vehicle technologies and could address 38 per cent of light vehicle crashes in the United States.⁶³ A 2011 study by Searson et al. updated the estimates of Farmer's earlier study by accounting for known limitations in the current technologies. AEB remained as the technology with the greatest potential, however the proportion of light vehicle crashes that were considered relevant was reduced to 20 per cent.⁶⁴

⁵⁸ Your Brakes, no date, *Automatic braking: coming soon to a highway near you*, <https://yourbrakes.com/automatic-braking-systems/>.

⁵⁹ Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits: Discussion of expert opinions*, Centre for Automotive Safety Research, The University of Adelaide, <http://acrs.org.au/files/papers/arcs/2015/SearsonD%20054%20Emerging%20vehicle%20safety%20technologies%20and%20their%20potential%20benefits.pdf>, p. 2.

⁶⁰ ANCAP, 2018, *Standard inclusion of autonomous emergency braking increases*, media release, <https://www.ancap.com.au/media-and-gallery/releases/standard-inclusion-of-autonomous-emergency-braking-increases-ten-fold>.

⁶¹ Ibid.

⁶² Ibid.

⁶³ Farmer, C.M, 2008, *Crash avoidance potential of five vehicle technologies*, Insurance Institute for Highway Safety, <http://www.iihs.org/frontend/iihs/documents/masterfiledocs.ashx?id=1826>, p. 2.

⁶⁴ Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits*, Royal Automobile Club of Victoria, <https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2016%20Emerging-Vehicle-Safety-Technology-Report.pdf>, p. 3.

A 2010 study by Robinson et al. estimated a 20 to 50 per cent effectiveness at reducing all injuries from rear-end crashes with stationary or moving vehicles if the heavy vehicle was fitted with AEB.⁶⁵

Another study conducted in 2011 simulated a representative sample of United States rear end collisions and found that AEB could reduce the number of light vehicle moderate to fatal injuries in striking vehicles by 36 per cent, and by 28 per cent for struck vehicles.⁶⁶

A 2012 study in Australia by Anderson et al. estimated that an optimised AEB system could reduce fatal crashes by 39 per cent and injury crashes by 48 per cent in light vehicles (including pedestrian crashes).⁶⁷

A 2014 study by Budd and Newstead stated that an AEB system at all speeds in all heavy vehicles, were estimated to produce the largest reduction in fatal heavy vehicle crashes, with a 25 per cent reduction in fatal crashes.⁶⁸ The study estimated this reduction would translate to cost savings of \$62-187 million for Australia.

In 2018, Transport for NSW estimated that 25 per cent of all heavy vehicle fatal crashes could be prevented from the mandating of AEB systems. Transport for NSW further advised that up to 17 per cent of Australian heavy vehicle serious injury crashes and up to three per cent of Australian property damage could be prevented through AEB fitment.⁶⁹

2.9 Forward Collision Warning Systems

Purpose

To monitor the forward path of a vehicle and warn the driver should an object or vehicle present a potential collision risk.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Forward Collision Warning Systems (FCWS) are considered 'other safety technology' and use laser or radar systems, sometimes in combination with cameras, to monitor both distance and relative speed to other objects or road users in the vehicle's forward travel path. The systems continuously analyse the driving environment to identify hazards including other vehicles, pedestrians, cyclists and motorcyclists. The driver receives visual and auditory alerts should the distance or approach speed to the object or road user be outside a predetermined safety margin. These warnings are designed to improve driver behaviour through targeted feedback about safe following distances. It is left to the driver to respond appropriately to the warning without intervention.

FCWS are not mandatory in light and heavy vehicles.

⁶⁵ Robinson, B.J, Hulshof, W, Robinson, T, & Knight, I, 2010, *AEBS and LDWS exemptions study: final report*, Transport Research Laboratory, https://circabc.europa.eu/sd/a/1e272beb-7a03-4238-a97b-b55669871968/report-aeb-laws_en.pdf.

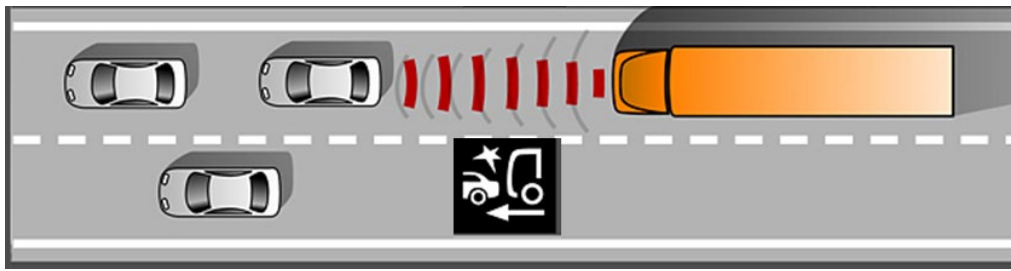
⁶⁶ Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits*, Royal Automobile Club of Victoria, <https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2016%20Emerging-Vehicle-Safety-Technology-Report.pdf>, p. 3.

⁶⁷ Anderson, R.W.G, Doecke, S.D, Mackenzie, J.R.R, Ponte, G., Paine, D, Paine, M, 2012, *Potential benefits of forward collision avoidance technology*, Vehicle Design and Research Pty Ltd. and Centre For Automotive Safety Research, University of Adelaide, <https://www.tmr.qld.gov.au/-/media/Safety/Vehicle-standards-and-modifications/Vehicle-standards/FCAT/fcatreport2012.pdf?la=en>.

⁶⁸ Budd, L & Newstead, S, 2014, *Potential safety benefits of emerging crash avoidance technologies in Australasian heavy vehicles*, Report, https://www.monash.edu/_data/assets/pdf_file/0003/216489/muarc324.pdf, p. x.

⁶⁹ Transport for NSW, 2018, *NSW Government submission: Staysafe inquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/60327/Submission%2042.pdf>, p. 58.

Figure 11. Forward Collision Warning System⁷⁰



Safety benefits

Research has found that FCWS may prevent between 21 and 44 per cent of crashes and reduce the severity of injuries.

In 2001, the Volvo Intelligent Vehicle Initiative Field Operational Test evaluated the effectiveness of FCWS in heavy vehicles and estimated the costs and benefits to society. The study found that a collision warning system with advanced cruise control and advanced braking system can help reduce rear-end crashes in heavy vehicles by 28 per cent (with 21 per cent of this reduction being attributable to the FCWS).⁷¹

A 2006 study by Fitch et al. estimated that a FCWS reduced the number of rear-end crashes in heavy vehicles by 21 per cent, preventing a total of 4,800 tractor-trailer rear-end crashes per year.⁷²

A 2008 study in the United States advised that the FCWS could potentially prevent or mitigate up to 2.3 million police-reported light vehicle crashes each year (38 per cent), including 1.4 million front-to-rear crashes.⁷³ The study estimated that up to half of all front-to-rear light vehicle crashes are not reported to police, so the potential for FCWS may be up to 3.7 million crashes prevented each year.⁷⁴

A 2009 study used efficacy rates of 21 per cent and 44 per cent derived from the 2001 Volvo Intelligent Vehicle Initiative Field Operational Test, to estimate that between 8,597 and 18,013 heavy vehicle rear-end crashes could be prevented by using the FCWS.⁷⁵

The Department of Transport and Main Roads in Queensland estimates that over the life of a heavy vehicle, the average benefit from fitting a FCWS is about \$13,700, far exceeding the estimated cost of \$1,400 and \$5,000 per vehicle fit out.⁷⁶

⁷⁰ DAF, no date, *Advanced emergency braking system*, <http://www.daf.global/en-en/trucks/comfort-and-safety-systems-euro-6/advanced-emergency-braking-system>.

⁷¹ Anderson, R.W.G, Doecke, S.D, Mackenzie, J.R.R, Ponte, G., Paine, D, Paine, M, 2012, *Potential benefits of forward collision avoidance technology*, Vehicle Design and Research Pty Ltd. and Centre For Automotive Safety Research, University of Adelaide, <https://www.tmr.qld.gov.au/-/media/Safety/Vehicle-standards-and-modifications/Vehicle-standards/FCAT/fcatreport2012.pdf?la=en>, p. 12.

⁷² Fitch, G.M, Rakha, H.A, Arafeh, M, Blanco, M, Gupta, S.K, Zimmermann, R.P, & Hanowski, R.J, 2008, *Safety benefit evaluation of a forward collision warning system*, Center for Truck and Bus Safety Virginia Tech Transportation Institute, National Highway Traffic Safety Administration, U.S. Department of Transportation, <https://one.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/PDFs/Crash%20Avoidance/2008/DOT-HS-810-910.pdf>, p. 3.

⁷³ Farmer, C.M, 2008, *Crash avoidance potential of five vehicle technologies*, Insurance Institute for Highway Safety, <http://www.iihs.org/frontend/iihs/documents/masterfiledocs.ashx?id=1826>, p. 10.

⁷⁴ Ibid.

⁷⁵ Murray, D, Shackelford, S, & Houser, A, 2009a, *Analysis of benefits and costs of forward collision warning systems for the trucking industry*, Federal Motor Carrier Safety Administration, U.S Department of Transportation, <https://rosap.ntl.bts.gov/view/dot/3>, p. vii.

⁷⁶ Department of Transport and Main Roads, 2017, *Forward collision avoidance technology*, <https://www.tmr.qld.gov.au/Safety/Vehicle-standards-and-modifications/Vehicle-standards/Forward-collision-avoidance-technology.aspx>.

2.10 Lane Departure Warning Systems

Purpose

To detect a vehicle unintentionally leaving its driving lane and alert the driver to take corrective action if required.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Lane Departure Warning Systems (LDWS) are considered 'other safety technology' and are a crash avoidance technology that uses forward and side viewing cameras to identify reflective lane markings to establish a vehicle's position within a lane, and to determine the road alignment and the vehicle's speed and direction of travel. Combined with information including steering wheel angle and indicator use, the system can determine if the driver is unintentionally leaving the intended driving path. If the system decides that the lane departure is unintentional, and the driver has taken no corrective action, the system responds first with a warning sound and light flash, and later with a steering wheel shudder (if the first warning is ignored). The LDWS deactivates when the driver uses the turn signal indicator during a lane change manoeuvre. Advanced systems may also attempt to take corrective action by applying counter-steer to maintain vehicle lane position.

Figure 12. Lane Departure Warning System⁷⁷



LDWS can prevent the following types of crashes:⁷⁸

- Single-vehicle roadway departure: Crash in which a truck departs the roadway from its lane of travel, either to the left or to the right
- Same-direction lane departure: Crash in which a truck departs its lane of travel and enters a lane of traffic traveling in the same direction as the truck
- Opposite-direction lane departure: Crash in which a truck departs its lane of travel and enters an oncoming-traffic lane.

LDWS are available to heavy vehicles as an after-market product and can be retrofitted to vehicles.

LDWS are not mandatory in light and heavy vehicles. However, action 9 of the National Road Safety Strategy Action Plan 2018-2020 states that governments will increase the

⁷⁷ UD Trucks, no date, *New Quon CW*, <https://www.udtrucks.com/en-au/trucks/quon/new-cw/safety>.

⁷⁸ Houser, A, Murray, D, Shackelford, S, Kreeb, R, & Dunn, T, 2009, *Analysis of benefits and costs of lane departure warning systems for the trucking industry*, Federal Motor Carrier Safety Administration, U.S. Department of Transportation and American Transportation Research Institute, https://rosap.nhtl.bts.gov/view/dot/4/dot_4_DS1.pdf, p. vii.

market uptake of safer new and used vehicles and emerging vehicle technologies with high safety benefits, including LDWS and lane keep assist.⁷⁹

Safety benefits

Several international and domestic studies have suggested that LDWS may prevent between four and 15 per cent of fatal crashes and reduce the severity of injuries.

A 2008 study in the United States reported that LDWS were relevant to the most fatal crashes and could prevent or mitigate up to 483,000 light vehicle crashes per year (eight per cent), including 87,000 non-fatal injury crashes and 10,345 fatal crashes.⁸⁰

A 2008 study in Germany predicted that LDWS may prevent four to 15 per cent of light vehicle crashes.⁸¹

In 2009, a study was conducted by Houser et al. in the United States and concluded that LDWS may result in a 23 to 53 per cent reduction for single heavy vehicle roadway departure collisions.⁸²

A 2010 study suggested a 20 to 60 per cent reduction in all severity of injuries resulting from LDWS sensitive crashes.⁸³

In 2011, an Australian study estimated a seven per cent (100 fatalities) reduction in fatalities and 4,177 in non-fatal injuries in the light vehicle fleet.⁸⁴

A 2011 study indicated that LDWS may have been relevant in as many as 179,000 light vehicle crashes per year including 7,529 fatal crashes and 37,000 non-fatal injuries per year in the United States for the 2004 to 2008 crash period.⁸⁵

In 2012, a European study reported that truck drivers found LDWS systems useful when fatigued, but otherwise irritating, despite the system being found to improve lateral control, slightly increase indicator usage and decrease lateral crash events.⁸⁶

In 2018, the NSW Inquiry estimated that mandating LDWS would prevent up to six per cent of all heavy vehicle fatal crashes and up to four per cent of heavy vehicle serious injury crashes.⁸⁷

⁷⁹ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 10.

⁸⁰ Farmer, C.M., 2008, *Crash avoidance potential of five vehicle technologies*, Insurance Institute for Highway Safety, <http://www.iihs.org/frontend/iihs/documents/masterfiledocs.ashx?id=1826>, p. 11.

⁸¹ Ibid; Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits*, Royal Automobile Club of Victoria, <https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2016%20-Emerging-Vehicle-Safety-Technology-Report.pdf>, p. 6.

⁸² Houser, A, Murray, D, Shackelford, S, Kreeb, R, & Dunn, T, 2009, *Analysis of benefits and costs of lane departure warning systems for the trucking industry*, Federal Motor Carrier Safety Administration, U.S. Department of Transportation and American Transportation Research Institute, https://rosap.ntl.bts.gov/view/dot/4/dot_4_DS1.pdf, p. ix.

⁸³ Robinson, B.J, Hulshof, W, Robinson, T, & Knight, I, 2010, *AEBS and LDWS exemptions study: final report*, Transport Research Laboratory, https://circabc.europa.eu/sd/a/1e272beb-7a03-4238-a97b-b55669871968/report-aeps-ldws_en.pdf.

⁸⁴ Anderson, R.W.G, Hutchinson, T.P, Linke, B.J, & Ponte, G, 2011, *Analysis of crash data to estimate the benefits of emerging vehicle technology*, Centre for Automotive Safety Research, University of Adelaide, <https://www2.ewu.edu/Documents/cbpa/nwttap/newsletter/publications/casr094.pdf>, p. iv.

⁸⁵ Searson, D, Ponte, G, , Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits*, Royal Automobile Club of Victoria, <https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2016%20-Emerging-Vehicle-Safety-Technology-Report.pdf>, p. 6.

⁸⁶ Budd, L & Newstead, S, 2014, *Potential safety benefits of emerging crash avoidance technologies in Australasian heavy vehicles*, Report, https://www.monash.edu/_data/assets/pdf_file/0003/216489/muarc324.pdf, p. 6.

⁸⁷ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/Final%20Report.pdf>, p. 18.

2.11 Intelligent Speed Assistance and Intelligent Speed Compliance

Purpose

To monitor the vehicle's speed and alert the driver if the vehicle exceeds the posted speed limit.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Intelligent Speed Assistance (ISA) are considered 'other safety technology' and use Global Positioning System (GPS), paired with accurate speed zone maps, to determine the posted speed limit for the current section of road and acts if the vehicle exceeds that speed limit. The action taken may be to alert the driver through visual, audible and/or haptic signals, or to prevent the vehicle being driven beyond the speed limit for prolonged periods. The technology uses maps or smart cameras or a combination and can be retrofitted to heavy vehicles. However, one barrier to uptake is the lack of suitable digital maps and databases of posted speed limits.

Figure 13. Intelligent Speed Assistance⁸⁸



Intelligent Speed Compliance (ISC) is a TCA certified telematics application which uses GNSS to independently monitor the speed of a heavy vehicle. Through ISC, speed is continuously measured and is calculated on a rolling average. ISC is an application under TCA's *National Telematics Framework* and can be used by regulators to obtain assurance that heavy vehicles are not exceeding a set speed threshold, and/or to detect faulty speed limiter devices. ISC generates electronic reports whenever a monitored vehicle is detected speeding, or when a malfunction or tampering is detected. The types of data collected by ISC are listed in Appendix A.

ISA and ISC are not mandatory in light and heavy vehicles. However, action 9 of the National Road Safety Strategy Action Plan 2018-2020 states that governments will increase the market uptake of safer new and used vehicles and emerging vehicle technologies with high safety benefits.⁸⁹

⁸⁸ European Transport Safety Council, 2018, *Intelligent Speed Assistance (ISA)*, <https://etsc.eu/tag/isa/>.

⁸⁹ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 10.

Safety benefits

NTI reported that of 606 truck crash incidents reported to NTI during 2015, inappropriate speed for the prevailing conditions accounted for 21.4 per cent of claims registered.⁹⁰ In cases where inappropriate speed was the finding, 49.4 per cent of crashes occurred on Mondays or Tuesdays.⁹¹

Research has suggested that ISA systems can further reduce heavy vehicle risks associated with speed and may prevent between 10 and 19 per cent of serious light and heavy vehicle crashes and injuries.

A 2008 Australian study provided a conservative estimate that active ISA systems would halve the risk of a light vehicle speeding-related crash, meaning that the technology could prevent at least 10 per cent of all serious crashes and a higher proportion of fatal crashes.⁹²

Transport for NSW reported that modelling based on a New South Wales ISA light vehicle trial estimated a 19 per cent reduction in fatal and serious injury crashes.⁹³

2.12 Adaptive cruise control

Purpose

To monitor traffic and maintain a safe distance from the vehicle ahead.

Applicable vehicle types

Light and heavy vehicles

Mechanism

Adaptive cruise control is considered 'other safety technology' and is an advanced system that uses radar and, in some cases, integrated vision systems to detect other road users in the path of travel. Adaptive cruise control monitors the traffic ahead and maintains a safe distance from the vehicle ahead. The driver selects a cruising speed and the system monitors the gap to the lead vehicle. The system decides whether it is safe to continue travelling at the pre-set cruise speed or whether brake application is required to maintain a safe following distance. When the following distance becomes too close, the engine is de-throttled and if necessary the brakes are applied automatically.

Adaptive cruise control is not mandatory in light and heavy vehicles. However, action 9 of the National Road Safety Strategy Action Plan 2018-2020 states that governments will increase the market uptake of safer new and used vehicles and emerging vehicle technologies with high safety benefits, including adaptive cruise control.⁹⁴

⁹⁰ National Transport Insurance, 2017, *2017 Major Accident Investigation Report*, http://www.nti.com.au/files/files/20147_NTARC_Report/C666_NTI_2017_Accident_Investigation_Report_LR_2.pdf, p. 5.

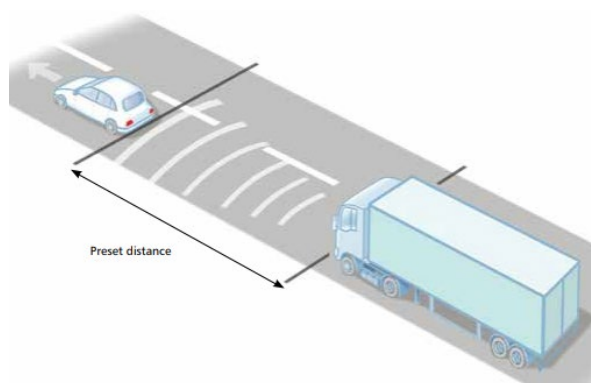
⁹¹ *Ibid.*, p. 13.

⁹² Paine, M, Healy, D, Passmore, J, Truong, J, & Faulks, I, 2008, *In-vehicle safety technologies – picking future winners*, <http://casr.adelaide.edu.au/rsr/RSR2008/PaineM.pdf>, p. 388.

⁹³ Transport for NSW, 2018, *NSW Government submission: Staysafe inquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/60327/Submission%2042.pdf>, p. 58.

⁹⁴ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 10.

Figure 14. Adaptive cruise control⁹⁵



Safety benefits

Much of the literature on adaptive cruise control is orientated to traffic flow rather than safety.

In 2008, a study estimated that this technology might lead to a trauma reduction of three per cent in light vehicles.⁹⁶

2.13 Alcohol ignition interlock schemes

Purpose

To prevent the operation of a motor vehicle by a person under the influence of alcohol.

Applicable vehicle types

Light and heavy vehicles

Mechanism

An alcohol interlock is an electronic breath testing device that prevents a vehicle from starting if it detects alcohol in the driver's breath sample. It requires a driver to provide a sample of breath before the vehicle can start and at random times while the vehicle is running. The driver's blood alcohol concentration must be lower than a pre-set threshold of the interlock. If sufficient alcohol is detected in the breath sample, the ignition system will be disabled, preventing the vehicle from starting for a predetermined period. To capture any attempts at circumventing the device, the interlock must be capable of taking photographs to identify the person who has provided the breath sample. Some systems also require repeated re-tests to ensure sobriety of the driver during vehicle use and to discourage another person to submit a test on behalf of the intended driver. The types of data collected by alcohol interlocks are listed in Appendix A.

The interlock device is usually court-imposed and records the compliance history of the driver for a specified period and is provided to the road authority. However, interlocks may have other purposes, such as encouraging a long-term reduction in drink-driving, contributing to alcohol rehabilitation, and reducing drink-driving in the general population (i.e., drivers who have not been detected drink-driving).

Legislation and policy in each Australian jurisdiction sets out the requirements for the program, including: the offences that trigger an alcohol interlock program, the amount of time a driver must participate in the program and the accredited alcohol interlock providers. The

⁹⁵ Transport for NSW, 2017, *Safety technologies for heavy vehicles and combinations*, <http://roadsafety.transport.nsw.gov.au/downloads/safety-technologies-heavy-vehicles.pdf>, p. 6.

⁹⁶ Anderson, R.W.G, Hutchinson, T.P, Linke, B.J, & Ponte, G, 2011, *Analysis of crash data to estimate the benefits of emerging vehicle technology*, Centre for Automotive Safety Research, University of Adelaide, <https://www2.ewu.edu/Documents/cbpa/nwtap/newsletter/publications/casr094.pdf>, p. 10.

approach and conditions applied by jurisdictions differ greatly, but strong government oversight of alcohol interlock service providers is consistent across states and territories.

Figure 15. Alcohol interlock device⁹⁷



Some northern European countries have expanded their interlock programs beyond application just to offenders, as a standard fitment in vehicle fleets to assure safety and quality risk management in occupational driving contexts. In addition, interlocks are now being viewed as quality assurance measures, as well as preventative measures in occupational health and safety contexts whereby some companies and authorities require drivers of buses (including school buses), taxis and trucks, to use their vehicle's fitted interlock before they begin their work shift.

Alcohol ignition interlocks are not mandatory in light and heavy vehicles. However, action F of the National Road Safety Strategy Action Plan 2018-2020 states that governments will strengthen efforts to reduce drink driving, including the review and adjustment of alcohol interlock programs to improve effectiveness in addressing drink driving.⁹⁸

Safety benefits

Research has suggested that alcohol interlocks may prevent between five and 24 per cent of fatal heavy vehicle crashes and 11 per cent of injuries.

A 2002 study estimated that an interlock would be 96 per cent effective in preventing all crashes where the driver's blood alcohol content exceeded 0.05.⁹⁹ The study predicted that an alcohol interlock would lead to the greatest reduction in crash numbers and costs, preventing 906 crashes and saving \$263 million per year.¹⁰⁰

A 2008 study suggested that an interlock might lead to a trauma reduction of five per cent.¹⁰¹

A 2009 Australian cost-benefit analysis suggested that requiring all new vehicles to be fitted with interlocks could reduce national road fatalities by 24 per cent and serious injuries by 11 per cent.¹⁰²

⁹⁷ Dräger, no date, *Dräger Interlock XT*, https://www.draeger.com/en_aunz/Alcohol-Interlock-Program/Products/Breath-Alcohol-and-Drug-Testing/Alcohol-Ignition-Interlock-Devices/Interlock-XT.

⁹⁸ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 12.

⁹⁹ Anderson, R.W.G, Hutchinson, T.P, Linke, B.J, & Ponte, G, 2011, *Analysis of crash data to estimate the benefits of emerging vehicle technology*, Centre for Automotive Safety Research, University of Adelaide, <https://www2.ewu.edu/Documents/cbpa/nwtap/newsletter/publications/casr094.pdf>, p. 22.

¹⁰⁰ Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits*, Royal Automobile Club of Victoria, <https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2016%20Emerging-Vehicle-Safety-Technology-Report.pdf>, p. 6.

¹⁰¹ Anderson, R.W.G, Hutchinson, T.P, Linke, B.J, & Ponte, G, 2011, *Analysis of crash data to estimate the benefits of emerging vehicle technology*, Centre for Automotive Safety Research, University of Adelaide, <https://www2.ewu.edu/Documents/cbpa/nwtap/newsletter/publications/casr094.pdf>, p. 23.

¹⁰² Bailey, T.J, Lindsay, V.L, & Royals, J, 2013, *Alcohol ignition interlock schemes: best practice review*, Centre for Automotive Safety Research, The University of Adelaide, <http://casr.adelaide.edu.au/casrpubfile/1420/CASR119.pdf>, p. 5.

3 What telematics and other safety technologies do safer operators use?

Key points

Many transport operators are using safety technologies and telematics to achieve safety, productivity and commercial outcomes. This section of the best practice review will provide a summary of survey data on the use of telematics and provide several case studies about how safer operators are using technology and telematics to promote safety and productivity benefits.

3.1 Overview

Many transport operators are increasingly adopting safety technologies and telematics to derive safety, productivity and commercial benefits. Safer operators are using technology to demonstrate compliance under chain of responsibility and to manage speed and fatigue of drivers. Safer operators have observed tangible improvements to safety and productivity outcomes.

This section of the best practice review will provide a summary of survey data on the use of telematics and provide several case studies about how safer operators are using technology and telematics to promote safety and productivity benefits.

3.2 Survey data on use of telematics

In 2018, Teletrac Navman conducted a survey with more than 2,400 fleet management and operations professionals in Australia.¹⁰³ The survey reported that there appears to be a disconnect between how a telematics solution can help ease business concerns and whether or not companies would see a significant enough return on investment to justify the cost.¹⁰⁴ Among respondents who use telematics, 89 per cent use telematics to monitor vehicle tracking, 67 per cent to monitor speed, 57 per cent to monitor distance travelled and 51 per cent to monitor driver hours.¹⁰⁵ The survey stated that the main benefits of using telematics include peace of mind knowing where vehicles or equipment are, improved driver behaviour, meeting compliance requirements, improved customer service and improved driver safety.¹⁰⁶ The report indicated that 12 per cent of respondents are currently using a business work and rest time management system, and 45 per cent intend to take up the technology when approved EWDs are available.¹⁰⁷

In 2017, Teletrac Navman conducted a survey with 1,200 fleet operators from around the world, including 107 operators located in Australia.¹⁰⁸ Survey responses indicated that 72 per cent of the transport businesses in the survey are using telematics across all vehicles/assets, nine per cent are using telematics when provided by the vehicle manufacturer, seven per cent plan to use telematics within the next year and 12 per cent

¹⁰³ Teletrac Navman, 2018, *2018 Telematics Benchmark Report*, https://marketing.teletracnavman.com/marketing/assets/industry%20insights/au/2018tn_telematicsbenchmark_au_rls0518.pdf.

¹⁰⁴ Ibid., p. 3.

¹⁰⁵ Ibid., p. 13.

¹⁰⁶ Ibid., p. 14.

¹⁰⁷ Ibid., p. 6.

¹⁰⁸ Teletrac Navman, 2017, *Telematics Benchmark Report Australian Transportation Edition*, p. 18, https://marketing.teletracnavman.com/marketing/assets/industry%20insights/au/2017transportbenchmarkreport_au_final.pdf.

have no immediate plans to use telematics.¹⁰⁹ Among respondents who use telematics or plan to introduce it in their operations, 82 per cent use telematics to monitor vehicle tracking, 74 per cent to monitor speed, 57 per cent to monitor distance driven and driver fatigue and 54 per cent to monitor maintenance.¹¹⁰

In 2014, ACA Research conducted a study with 205 Australian road freight transport companies that revealed 35 per cent of these operators were using telematics.¹¹¹ Of those operators using telematics, 92 per cent were using telematics for vehicle tracking features.¹¹² Features associated with compliance, such as monitoring fatigue, were less commonly used (39 per cent). The study found that the most common reason operators were not using telematics was due to the fleet size, with smaller operators believing the cost of the equipment outweighed the benefits relative to their fleet size.¹¹³

In 2012, the NTC conducted two surveys with 400 freight operators and 500 heavy vehicle drivers: *Survey on Compliance, Enforcement and Speed* and *Survey on Driver Fatigue*.

The *Survey on Compliance, Enforcement and Speed* asked companies and drivers about the operational and compliance practices their company had in place, including the use of 'monitoring' and 'electronic monitoring' of driver behaviour. The study found that 79 per cent of drivers and 42 per cent of operators had monitoring and preventative practices in place that used technology.¹¹⁴ These forms of technology included GPS tracking to monitor speed (used by 54 per cent of companies), use of speed limiters (used by 21 per cent of companies) and other type of computer device in-vehicle (used by 17 per cent of companies).¹¹⁵

The *Survey on Driver Fatigue* asked drivers and operators about the ways in which they monitored fatigue. The study found that 44 per cent of companies and 53 per cent of drivers used electronic monitoring systems to monitor fatigue.¹¹⁶ Of those who used electronic monitoring systems, 92 per cent of companies used satellite tracking or GPS.¹¹⁷ Electronic work diaries (20 per cent) and lane monitoring devices (27 per cent) were also used, as well as other devices/software (24 per cent) including the IAP and on-board driver communication systems.¹¹⁸ The study concluded that larger companies were more likely than smaller operators to have practices in place, including monitoring the levels of fatigue, and using an electronic monitoring device.¹¹⁹

3.3 Operator use of telematics and other safety technology

3.3.1 J.J. Richards and Sons

J.J. Richards and Sons is one of the largest privately-owned waste management company in Australia.

¹⁰⁹ *ibid.*, p. 11.

¹¹⁰ *ibid.*, p. 12.

¹¹¹ ACA Research, 2014, *New Automotive Research: The Use of Telematics in Road Freight Transport Companies*, <http://www.acaresearch.com.au/australian-market-research-blog/bid/333093/New-Automotive-Research-The-Use-of-Telematics-in-Road-Freight-Transport-Companies>.

¹¹² *ibid.*

¹¹³ *ibid.*

¹¹⁴ National Transport Commission, 2012, *Reform Evaluation in the Road Transport Industry, 2012: Survey on Compliance, Enforcement and Speed*, p. 39, [https://www.ntc.gov.au/Media/Reports/\(2B3C0C37-2A76-4811-C815-02A229BDD24D\).pdf](https://www.ntc.gov.au/Media/Reports/(2B3C0C37-2A76-4811-C815-02A229BDD24D).pdf).

¹¹⁵ *Ibid.*, p. 41.

¹¹⁶ National Transport Commission, 2012, *Reform Evaluation in the Road Transport Industry, 2012: Survey on Driver Fatigue*, p. 26, [https://www.ntc.gov.au/Media/Reports/\(7A1EF335-ACF2-6F1A-7445-6F72466013D9\).pdf](https://www.ntc.gov.au/Media/Reports/(7A1EF335-ACF2-6F1A-7445-6F72466013D9).pdf).

¹¹⁷ *Ibid.*, p. 27.

¹¹⁸ *Ibid.*

¹¹⁹ *Ibid.*, p. 25.

During the NSW Inquiry, J.J. Richards and Sons advised that they were one of four finalists in the 2014 Australian Road Safety Awards for speed limiting their entire heavy vehicle fleet to a maximum of 90 kilometres per hour.¹²⁰ J.J. Richards and Sons explained the benefits of this technology to include shorter stopping distances and more time to identify and react to dangers ahead and a reduction in fuel burn.¹²¹

J.J. Richards and Sons stated that one of the highest priorities when selecting a new fleet was safety features.¹²² J.J. Richards and Sons reported their fleet has collision warning with emergency braking, ESC, daytime running lights and telematics. J.J. Richards and Sons use telematics to monitor and optimise collection of vehicle performance and daily service information.¹²³ J.J. Richards and Sons advised that they use telematics data to produce an accurate record of compliance with driving regulations including rest breaks and legal loading to meet chain of responsibility requirements.¹²⁴ J.J. Richards and Sons stated they are actively investigating the installation of Seeing Machines for long distance operations.¹²⁵

3.3.2 Linfox Logistics

In 2018, Linfox Logistics CEO Mark Mazurek, reported that Linfox intends to set an example for safe practice in Australia.¹²⁶ Mr Mazurek advised that safety and compliance is the number one focus for Linfox, which is reflected in Linfox's Vision ZERO ethos.¹²⁷

In February 2018, it was announced that Linfox had partnered with Telstra and MTData to implement an advanced telematics and management solution into its Australian truck fleet.¹²⁸ The Internet of Things (IoT) technology will be rolled out to the whole Linfox truck fleet and will deliver advanced transport and logistics data, quality benchmarking information to enhance public and driver safety on Australian roads.

The IoT solution will include Samsung tablets mounted into Linfox heavy vehicles so drivers can access logbooks, safety checklists and produce in-cabin readings of speed and distance.¹²⁹

3.3.3 Rod Pilon Transport, TRUCKRIGHT Industry Vehicle

Rod Pilon Transport driver, Rod Hannifey, drives a TRUCKRIGHT Industry Vehicle (TIV), which aims to improve awareness and road safety through the promotion of road safety facts and tips on the outside of the vehicle.¹³⁰ Many sponsors have contributed to the TIV, from the photos on the curtains, to other safety equipment on board. The TIV is a seven-year-old Kenworth K200 which is speed limited to 98 kilometres per hour. Rod offers road authority staff an opportunity to travel in the TIV and experience things from the seat of a truck. Rod also attends road transport events to further promote and educate people about road safety.

¹²⁰ Forster, H, 2018, *Enquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/59787/Submission%205.pdf>, p. 3.

¹²¹ Ibid.

¹²² Ibid., p. 4.

¹²³ Ibid.

¹²⁴ Ibid.

¹²⁵ Ibid., p. 3.

¹²⁶ Logistics and Materials Handling, 2018, *New Linfox CEO reveals safety agenda*, <https://logisticsmagazine.com.au/new-linfox-ceo-reveals-safety-agenda/>.

¹²⁷ Mazurek, M, 2018, *Inquiry into heavy vehicle safety and use of technology to improve road safety*, <https://www.parliament.nsw.gov.au/ladocs/submissions/60322/Submission%2037.PDF>, p. 3.

¹²⁸ Telstra, 2018, *Telstra will deliver IoT solutions to Linfox fleet over Australia's largest and fastest mobile network*, media release, <https://www.telstra.com.au/aboutus/media/media-releases/Linfox-signs-Internet-of-Things-partnership-deal-with-Telstra1>.

¹²⁹ Ibid.

¹³⁰ Hannifey, R, 2018, *TRUCKRIGHT aims*, http://www.ultimatesemitrucks.com/truckright_aims_1.html.

The TIV has Teletrac Navman telematics installed to allow Rod to operate under the IAP for higher mass limits loads and enter work and rest times in the work and rest time management system. Through sponsorship by Teletrac Navman, Rod is currently trialling a work and rest time management system and providing regular feedback to improve the system. The work and rest time management system provides a countdown of when the next rest break is due and will highlight in red if a work or rest breach is detected.

For the last 10 years, Rod has been using a Department of Transport and Main Roads GPS tracker in the TIV. Rod uses the tracker to enter location data to assist with road maintenance and marking of reflector bays. This information is then sent to Transport and Main Roads for review and action.

The TIV also has the latest safety technology (Kenworth level three) onboard. The TIV has emergency brake assist, which brings the vehicle to an 80 per cent stop if the vehicle in front comes closer than a three second distance, adaptive cruise control, ESC and anti-lock braking.

3.3.4 Ron Finemore Transport

During the NSW Inquiry, Ron Finemore Transport advised that they have safety technology available in every vehicle (210 in total), including safety technology provided by the manufacturer, telematics devices and Seeing Machines fatigue and distraction technology.¹³¹

Mr Finemore explained that it is about having the right tools and using them for the right purpose.¹³² Mr Finemore also explained Ron Finemore Transport coaches their drivers to positively change their driving habits. Ron Finemore Transport has a green, amber and red rating system for drivers, and encourage drivers to 'keep in the green'.

Mr Finemore explained that Ron Finemore Transport use telematics data to advise of incidents, harsh braking events and real-time speeding alerts (if the device is operating within an area with signal). This information is sent in daily and weekly reports to area managers for review. Trainers also use the information to coach drivers on their performance. For example, a harsh braking event may be recorded at a roundabout. Trainers can review this data and coach the driver to slow down when they approach roundabouts in the future.

Mr Finemore advised that data collected can also be used to track scheduled maintenance for vehicles through the recording of kilometres travelled and the fuel economy of the vehicle and driver.

Mr Finemore advised that Ron Finemore Transport has invested over \$1 million in the last two years in Seeing Machines technology.¹³³ Although Ron Finemore Transport has reported improved road safety outcomes as a result, Mr Finemore advised there needs to be more flexibility for drivers under the regulations.¹³⁴ Mr Finemore advised that he has commenced a \$6.5 million Advanced Safe Truck Concept study, with Seeing Machines, Monash University, the Federal Government and Volvo, which aims to reduce fatal truck crashes by developing new vehicle technologies.¹³⁵ The research will study driver behaviour and provide a better understanding of the impact of driver fatigue and distraction in particular. Advanced Seeing Machines technology will be fitted to ten vehicles in the Ron

¹³¹ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Report on proceedings before Staysafe Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/transcripts/285/Corrected%20%20Transcript%20-%209%20April%202018.pdf>, p. 10.

¹³² Ibid.

¹³³ Ibid., p. 15.

¹³⁴ Ibid.

¹³⁵ Ron Finemore Transport, 2018, *Articles in Category: News*, <http://www.ronfinemoretransport.com.au/news>.

Finemore Transport fleet and link in-cab driver monitoring technology with external traffic and roadway in real-time.¹³⁶ The project is expected to be completed at the end of 2019.¹³⁷

3.3.5 Simon National Carriers

During consultation for the review of regulatory telematics, the NTC met with David Simon from Simon National Carriers. Mr Simon explained that the company had developed its own in-vehicle telematics solution to meet the needs of his business. Mr Simon advised that his system records location, speed and self-declared mass and integrates a business work and rest time management system with payroll and their own freight management systems. Mr Simon advised that whilst there is always a question about what evidentiary standard will be recognised by a court, the current Simon National Carriers system with high frequency of sampling, together with other sources of data such as toll points, fuel locations, and systems such as Safety Cam to correlate and verify common data points should provide comfort to the courts of the validity of the data from most systems.

Mr Simon stated Simon National Carriers does not use the IAP, as there are very few places where higher mass limits with IAP would offer any benefits across Simon National Carriers' routes. Mr Simon commented the IAP may be beneficial for operators who have permanent runs, but without that the high cost is prohibitive for infrequent use.

3.3.6 Toll Group

During the NSW Inquiry, Toll Group advised they are currently undergoing a \$1.5 billion equipment upgrade, which includes introducing a new fleet with the latest safety equipment and telematics on board.¹³⁸ Toll Group also advised that their managing director has issued a direction that every new vehicle purchased must have telematics.¹³⁹ Toll commented that the benefits they will see from that roll out of new technology will be enormous.¹⁴⁰

In addition, as outlined earlier in the paper, Toll Group advised that they have instituted a telematics and speed alert system that produces a back-to-base alert when a vehicle exceeds 100 kilometres per hour. Toll Group reported that before installation of the telematics, they were experiencing about 150 speeding events per month.¹⁴¹ However, in the three years from July 2012 to May 2015, there was a 75 per cent reduction in the number of speed alerts between 105 and 106 kilometres per hour.¹⁴² Toll Group explained there was also a 60 per cent reduction in the number of speed alerts between 107 and 108 kilometres per hour, and no speed alerts for events greater than 110 kilometres per hour.¹⁴³

3.3.7 Wettenhalls

Wettenhalls provides responsive, safe and innovative transportation solutions across Australia. Wettenhalls has a team of over 200 skilled employees and subcontractors who work across 15 sites. Wettenhalls has a ZERO HARM vision and a key business priority to improve the driver safety environment.

¹³⁶ Ibid.

¹³⁷ Ibid.

¹³⁸ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Report on proceedings before Staysafe Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/transcripts/285/Corrected%20%20Transcript%20-%209%20April%202018.pdf>, p. 34.

¹³⁹ Ibid., p. 38.

¹⁴⁰ Ibid, p. 34.

¹⁴¹ Ibid.

¹⁴² Ibid.

¹⁴³ Ibid.

Wettenhalls has a culture of rigorous driver training to promote well-being, personal development and safety awareness. In the driver training program the trainer spends time with each Wettenhalls' driver to discover how their driving skills could be improved.¹⁴⁴ Topics covered include road manners, etiquette, "green" (environmentally considerate) driving techniques, general up skilling and upkeep of the truck cabin.¹⁴⁵ The training program not only builds a strong workplace culture, but drivers are supported, look after equipment, learn new skills and drive safely.

Wettenhalls use Seeing Machines technology called Guardian to monitor driver fatigue. Wettenhalls participated in a Seeing Machines case study which outlined that since the initial roll out of Guardian in 2016, the incidence of fatigue events in the fleet has been dropping in inverse relationship to the number of installations: as the system is fitted in more and more trucks, the number of fatigue events drops lower and lower.¹⁴⁶ The case study notes that Wettenhalls management has been able to use data generated by Guardian to adjust schedules and rosters to reduce fatigue.¹⁴⁷ Wettenhalls considers Guardian to be an essential aid to driver safety and has committed to installing Guardian across their entire fleet (they currently have Guardian fitted to 80 per cent of the fleet).¹⁴⁸

Wettenhalls is currently replacing approximately 20 per cent of their existing fleet per annum. This ensures that Wettenhalls keep on the forefront of new technology. Wettenhalls' newest prime mover fleet includes technology such as: adaptive cruise control, FCWS, ESC and LDWS.¹⁴⁹

Wettenhalls monitor their fleet using telematics supplied by MTData which provides insights into fuel consumption, speed, time on road and time since resting.¹⁵⁰

3.3.8 Chain of responsibility

The review of regulatory telematics conducted by the NTC uncovered diverse attitudes towards telematics across the industry.

During consultation, stakeholders advised that chain of responsibility has positively influenced some operators to make the right choices and ensure they can demonstrate compliance.¹⁵¹ Some industry stakeholders provided anecdotal evidence that some operators will not use vehicles if telematics devices are not fully functioning because of chain of responsibility duties.¹⁵²

However, most industry stakeholders agreed that chain of responsibility laws have not been a key driver for the uptake of regulatory telematics. They agreed that HVNL amendments in 2018 to introduce a primary safety duty and executive officer liability may address this, but increased and focused enforcement of chain of responsibility obligations would be a significant incentive to invest in regulatory telematics.¹⁵³

¹⁴⁴ Wettenhalls, 2018, *Safety & Environment*, <http://www.wettenhalls.com.au/about/safety>.

¹⁴⁵ Ibid.

¹⁴⁶ Seeing Machines, 2018, *Wettenhalls & Guardian – for the driver, it's just 'get in & drive'*, <http://www.seeingmachines.com/guardian/wp-content/uploads/sites/2/2018/04/Wettenhalls-Case-Study.pdf>.

¹⁴⁷ Ibid.

¹⁴⁸ Ibid.

¹⁴⁹ Wettenhalls, 2018, *Safety & Environment*, <http://www.wettenhalls.com.au/about/safety>

¹⁵⁰ Ibid.

¹⁵¹ National Transport Commission, 2018, *Review of Regulatory Telematics*, Report, [https://www.ntc.gov.au/Media/Reports/\(58FFC40D-7F0C-C889-F83E-107C3BE07825\).pdf](https://www.ntc.gov.au/Media/Reports/(58FFC40D-7F0C-C889-F83E-107C3BE07825).pdf), p. 44.

¹⁵² Ibid.

¹⁵³ Ibid.

3.3.9 Cultural benefits of telematics use

Telematics can drive efficiency and build a culture of safety and performance. Telematics can identify and monitor 'at risk' driving behaviour, reduce the frequency of safety problems, assist in developing targeted driver education programs and reward drivers for safe driving behaviours.

Used effectively, telematics can positively influence drivers' behaviours, attitudes and the safety culture of an organisation. Telematics data reports can highlight trends in unsafe behaviours such as speeding and harsh braking, which can then inform data-based and targeted driver training programs. As drivers know they are being monitored through telematics this may encourage them to drive safely and comply with regulatory requirements, speed limits, and internal policy requirements. Telematics data can also be used to reward safe driving behaviours. This benefit may also extend into the future whereby drivers will only work for operators who use telematics and promote safe driving behaviours.

During consultation for the review of regulatory telematics, transport operators commented that telematics data can be used as a tool to develop targeted training for staff and to motivate drivers to modify their behaviours to become a safer driver.¹⁵⁴ In addition, operators such as Ron Finemore Transport, use telematics data to coach drivers and promote safe driving behaviours.

By managing and improving driver behaviour through telematics, the safety culture of an organisation can move from reactive to proactive.

¹⁵⁴ Ibid., p. 37.

4 How can uptake of telematics and other safety technologies be increased?

Key points

Despite the widespread optimism and the known benefits about in-vehicle safety technology, the uptake and early adoption of the technology remains low. This section of the best practice review will explore how accelerated adoption and use of these technologies can be promoted.

4.1 Overview

While there is optimism about the safety benefits and effects of telematics and safety technology, the question still arises, how can accelerated adoption and use of these technologies be promoted?

The NSW Inquiry made eight recommendations and several findings relevant to increasing the uptake and future use of technology by industry.¹⁵⁵ Notably, the Staysafe Committee recommended that safety technology such as adaptive cruise control, LDWS and AEB, should be the focus of implementation policy, regulation and other strategies to encourage early adoption by the heavy vehicle industry.¹⁵⁶

There are many mechanisms for accelerating the uptake and use of telematics and other safety technology. These may include:

- Awareness campaigns about telematics and safety technologies
- Fast tracking the adoption of technologies into vehicle standards
- Regulatory incentives
- Financial incentives
- Productivity incentives
- Updating government fleet and service contracts
- Heavy vehicle safety technology and telematics trials.

4.2 Awareness campaigns about telematics

Accelerated adoption and use of telematics may be achieved through raising consumer awareness through smart and targeted campaigns to industry including, transport operators, heavy vehicle owners and drivers and heavy vehicle peak bodies.

The campaigns could be led by heavy vehicle peak bodies, including the NTC, the NHVR, the Australian Trucking Association (and state and territory equivalents), NatRoad, the Heavy Vehicle Industry Australia, telematics service providers and TCA to encourage uptake and early adoption. The campaigns may include: targeted campaigns for smaller operators, IAP what's in it for me? case studies, electronic work diaries and the development of a best practice model for regulatory telematics.

¹⁵⁵ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/Final%20Report.pdf>, pp. vi-viii.

¹⁵⁶ Ibid, p. vii.

4.2.1 Targeted campaigns for smaller operators

Approximately 70 per cent of transport operators have one truck in their fleet and approximately 24 per cent have two to four trucks.¹⁵⁷ These statistics indicate that smaller operators comprise the majority of the heavy vehicle sector. To achieve accelerated uptake of telematics and other safety technology, these smaller operators should be targeted to increase awareness, address perceived barriers and highlight the real benefits of telematics and other safety technology. Any awareness campaign should be founded on genuine benefits.

Smaller industry and representative bodies could lead these awareness campaigns, such as the Australian Trucking Association (and state and territory equivalents), the Australian Livestock and Rural Transporters Association and local government.

4.2.2 IAP What's In It For Me? TCA case studies

TCA has worked with IAP participants, transport operators, road agencies, IAP service providers and local government to develop several case studies to communicate the benefits of the IAP.¹⁵⁸ The case studies are titled 'IAP What's In It For Me?' and provide an overview of how IAP is being used, for what vehicles and the scale of productivity and safety benefits derived from the IAP.

4.2.3 Electronic work diaries

The introduction of EWD for fatigue-regulated heavy vehicles later in 2018 presents an opportunity for heavy vehicle peak bodies and government agencies to leverage and raise awareness of the safety benefits of this technology.

The NHVR has produced a suite of education and guideline materials for drivers, operators, record keepers and technology providers.¹⁵⁹ The NHVR communicated the release of these documents to their members via an Industry Alert on 19 June 2018.¹⁶⁰

4.2.4 Best practice model for regulatory telematics

The development of a best practice model for regulatory telematics in 2019 presents an opportunity for the NTC, in collaboration with government agencies and peak transport bodies, to build industry awareness of the benefits of telematics application. The NTC intends to engage with the heavy vehicle industry to co-design the best practice model for regulatory telematics and during this process, highlight the benefits and opportunities offered through adopting telematics.

4.3 Awareness campaigns about safety technology

Accelerated uptake may be achieved through raising consumer awareness about safety technologies through smart and targeted campaigns to industry including, transport operators, heavy vehicle owners and drivers and heavy vehicle peak bodies. The campaigns could be led by heavy vehicle peak bodies, including the National Heavy Vehicle Regulator, Australian Trucking Association, NatRoad, the Heavy Vehicle Industry Australia, and state and territory peak transport bodies, telematics providers and TCA, as well as ANCAP, state and territory motoring organisations and insurance companies to encourage early adoption.

¹⁵⁷ National Transport Insurance, 2016, *NTI's Guide to the Trucking Industry 2016*, <https://www.nti.com.au/document/nti-guide-to-the-trucking-industry-2016.pdf>, p. 6.

¹⁵⁸ Transport Certification Australia, 2017, *IAP What's In It For Me?*, <https://tca.gov.au/truck/iap/iap-whats-in-it-for-me>.

¹⁵⁹ National Heavy Vehicle Regulator, 2018, *Electronic Work Diary (EWD)*, <https://www.nhvr.gov.au/safety-accreditation-compliance/fatigue-management/electronic-work-diary>.

¹⁶⁰ National Heavy Vehicle Regulator, 2018, *On the Road*, <https://www.nhvr.gov.au/files/201806-0862-on-the-road-issue-37.pdf>.

The following campaigns have been run in the past to publicise the importance of vehicle safety features and telematics. Although these examples are focused on the light vehicle market, they still demonstrate the effectiveness of targeted awareness campaigns.

4.3.1 NRMA survey

A 2014 survey by the NRMA reported that despite 95 per cent of Australian drivers claiming safety is their first priority, only one in 10 drivers felt they were truly knowledgeable about car safety.¹⁶¹ The study also found that less than 30 per cent of people were able to answer what ABS was and only 20 per cent knew what ESC stood for.¹⁶² As a result of the survey findings, the NRMA created a NRMA Insurance Crashed Car Showroom, an interactive exhibition in Sydney's CBD, to help Australians make informed purchasing decisions around safety technology.¹⁶³

4.3.2 ANCAP Stars on Cars in South Australia

A 2013 study assessed the ANCAP "Stars on Cars" marketing program in South Australia.¹⁶⁴ The aim was to increase sales of four and five star rated cars in South Australia by educating customers at new car dealerships, via the Internet and print advertising. The results found that in 2010, 40.9 per cent of new cars sold in South Australia were five-star, while in 2011 this figure increased to 49.4 per cent and in 2012 it jumped to 60.9 per cent, well ahead of the national average.¹⁶⁵

4.3.3 Western Australia promotion of Electronic Stability Control

Another example involved the promotion of ESC in regional and remote areas of Western Australia during various periods of 2012 and 2013. The authors of the study reported positive levels of campaign message awareness (12 per cent unprompted awareness and 77 per cent prompted awareness).¹⁶⁶ Additionally, the findings indicated a positive impact on vehicle purchasing behaviour intentions. Of those who saw the campaign, 71 per cent said they were more likely to choose a vehicle with ESC when considering their next vehicle purchase.¹⁶⁷

4.3.4 Electronic Stability Control for heavy vehicles

The introduction of mandatory ESC for new heavy vehicle trailers presents an opportunity for relevant advocacy, peak body and government agencies to raise awareness of the safety benefits this safety technology offers.

The Heavy Vehicle Industry Australia advised they will be undertaking an education and awareness campaign for their members around the benefits of ESC to promote higher uptake.

¹⁶¹ NRMA, 2014, *Two thirds of Australian drivers don't know what ABS is*, press release, <http://www.nrma.com.au/two-thirds-australian-drivers-don't-know-what-abs>.

¹⁶² Ibid.

¹⁶³ Ibid.

¹⁶⁴ Leyson, M, 2013, *ANCAP Stars on Cars dealership program: Increase sales of 4 and 5 star rated cars*, Road Safety Research, Policing and Education Conference, Brisbane, <http://acrs.org.au/files/arsrpe/Paper%20164%20-%20Leyson%20-%20Vehicle%20Safety.pdf>.

¹⁶⁵ Ibid., p. 1.

¹⁶⁶ Searson, D, Ponte, G, Hutchinson, T.P., Anderson, R, and Lydon, M, 2015, *Emerging vehicle safety technologies and their potential benefits*, Royal Automobile Club of Victoria, <https://www.racv.com.au/content/dam/racv/images/public-policy/reports/2016%20-Emerging-Vehicle-Safety-Technology-Report.pdf>, p. 11.

¹⁶⁷ Ibid.

Western Australia advised they promote ESC, RSC and IAP through the WA PBS Scheme. These systems are mandatory for PBS vehicles and operators are fitting the systems to their vehicles to future proof them.

Queensland's Heavy Vehicle Safety Action Plan 2016-18 presents 31 initiatives across six key areas, including a commitment to provide industry with information regarding changes to ADR, industry innovations, technological advances and research findings that promote heavy vehicle safety.¹⁶⁸

4.3.5 Fatigue and drowsiness detection devices technology

The fatigue management system Guardian by Seeing Machines was recently showcased at the supply chain and logistics trade show MEGATRANS2018 to give the wider transport sector an opportunity to experience and understand the product.¹⁶⁹ The benefits of the exhibition included brand awareness, a customer focus and ability to demonstrate Guardian by Seeing Machines.

In July 2018, the NTC released a video to illustrate the work being undertaken with the Cooperative Research Centre for Alertness, Safety and Productivity (Alertness CRC) to evaluate the impacts of the HVNL on driver fatigue.¹⁷⁰ The video aims to raise awareness of the effect of fatigue and how various fatigue and drowsiness detection technology is assisting with research in this space.

4.4 Fast tracking the adoption of technologies into vehicle standards

Mandating safety technology through vehicle standards and ADR is an effective way to accelerate adoption of technology.

The Australian Government's policy is to harmonise the national vehicle safety standards with international regulations where possible. The Australian Government is a signatory to a key international agreement, administered by the United Nations Economic Commission for Europe (UNECE), which provides a framework for the international harmonisation of technical standards for vehicle design.

As outlined earlier, action 4 of the National Road Safety Strategy Action Plan 2018-2020 states that governments will increase deployment of AEB in both heavy and light vehicles through ADR.¹⁷¹ By 2020, governments would like the majority of consumers purchasing vehicles fitted with AEB, through mandating AEB in heavy and light vehicles, as well as increasing voluntary uptake.¹⁷²

The recently announced mandate for ESC for heavy trucks and buses and RSC for heavy trailers through ADR is an example of how Australia has aligned with international standards (in Europe and the US), which should ultimately lead to fast-tracked adoption by the heavy vehicle industry.

¹⁶⁸ Department of Transport and Main Roads, 2016, *Queensland's Heavy Vehicle Safety Action Plan 2016-18*, <https://www.tmr.qld.gov.au/-/media/Safety/roadsafety/Strategy-and-action-plans/heavyvehiclesafetyactionplan2016.pdf?la=en>, p. 8.

¹⁶⁹ MEGATRANS2018, *Connect Source brings fatigue management to the fore*, <http://www.megatrans2018.com.au/connect-source-brings-fatigue-management-to-the-fore/>.

¹⁷⁰ National Transport Commission, 2018, *Real-world research to evaluate heavy vehicle driver fatigue*, <https://www.youtube.com/watch?v=ttFi-vk6li4&t=1s>.

¹⁷¹ Transport and Infrastructure Council, 2018, *National Road Safety Action Plan 2018-2020*, http://roadsafety.gov.au/action-plan/files/National_Road_Safety_Action_Plan_2018_2020.pdf, p. 7.

¹⁷² Ibid.

4.5 Flexible regulatory incentives

Accelerated uptake and use of telematics and other safety technology may be encouraged through offering regulatory incentives to industry, such as improved road access and greater flexibility in managing driver fatigue. Operators may be able to leverage their use of telematics and safety technology, in conjunction with a robust safety management system, to demonstrate they are meeting their regulatory requirements. This level of flexibility would encourage operators to consider using telematics and safety technology as an alternative means to manage compliance and risk.

The IAP is an example of telematics providing a regulatory incentive to industry. Operators enrol in the scheme, provide location data to road managers and receive improved road access in return. The regulatory incentives offered to industry through telematics devices, such as the IAP, could be expanded and provide a greater value proposition for industry in the form of access and mass concessions.

4.6 Financial incentives

Higher uptake and use of safety technologies and telematics may be encouraged through offering financial incentives to consumers, such as reduced insurance or registration premiums or stamp duty exemptions for operators when upgrading their fleet.

However, following the Global Financial Crisis, BITRE investigated providing rebates to operators to upgrade their fleet. The findings of the research indicated that rebates would not encourage smaller operators to upgrade their fleet and would only influence operators who would have upgraded their fleet regardless of any incentive offered.

The National Road Safety Strategy 2011-2020 recommends that incentives are investigated (including tax-based, registration-based and insurance incentives) and promote options to encourage the purchase of safer vehicles.¹⁷³

As part of the NSW Inquiry, industry advised that heavy vehicle safety outcomes could be improved by removing the cost barrier for small to medium businesses to upgrade their fleet.¹⁷⁴ Toll Group noted that no jurisdiction in Australia offers any incentive for truck owners to upgrade their fleet.¹⁷⁵ It was suggested that reductions or exemptions from stamp duty for operators when upgrading their fleet by purchasing safer vehicles could accelerate uptake of safety technology and telematics.¹⁷⁶

Industry also suggested that regulatory agencies could provide rebates on the annual cost per vehicle of registration and insurance to encourage investment in safety technologies.¹⁷⁷

Finally, the Staysafe Committee recommended that the NSW government examine the value of an incentives scheme with the aim of assisting small operators and operators least able to afford converting or replacing their vehicles, to acquire new technology.¹⁷⁸

¹⁷³ Australian Transport Council, 2011, *National Road Safety Strategy 2011-2020*, http://roadsafety.gov.au/nrssl/files/NRSS_2011_2020.pdf, p. 77

¹⁷⁴ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/inquiries/2467/Final%20Report.pdf>, p. 48.

¹⁷⁵ Ibid.

¹⁷⁶ Ibid, p. 49.

¹⁷⁷ Ibid, p. 48.

¹⁷⁸ Ibid, p. viii.

4.7 Productivity incentives

Higher uptake and use may be encouraged through communicating the various productivity benefits offered through safety technologies and telematics.

Productivity incentives include providing operators with:

- data on how, when and where vehicles are being used, which allows operators to plan for future opportunities
- insights into short and long-term trends around which vehicles are being overworked or underutilised
- improved access to roads and route choices and providing operators with the ability to undertake the same freight task with significantly fewer journeys
- opportunities to achieve productivity gains across supply chains
- opportunities to enhance the capability of back office systems ensuring the business operates in an efficient manner
- data to meet chain of responsibility obligations.

During consultation for the review of regulatory telematics, service providers advised operators are gaining a significant economic advantage when running higher mass limits under the IAP. One interviewee provided an example of the cost of the IAP for a vehicle being recovered from one extra pallet per trip.¹⁷⁹

4.8 Updating government fleet and service contracts

Increased adoption rates for safety technologies and telematics may be achieved through government fleet purchasing policies establishing minimum standards for new passenger vehicles, heavy vehicles and contracted vehicles. For example, government departments may commit to only purchasing ANCAP five-star vehicles or may only enter into contracts with companies who meet a specified safety standard.

The National Road Safety Strategy 2011-2020 requires all government fleets to implement nationally-agreed fleet purchasing policies and encourage adoption by other fleet operators.¹⁸⁰

In 2011, the South Australian government announced they would mandate ANCAP five-star passenger vehicles for the state government passenger vehicle fleet and four stars for light commercial vehicles in the state government fleet.¹⁸¹

In 2011, the Commonwealth government also introduced the highest vehicle safety standards on its own fleet, requiring that all light passenger vehicles have a five-star ANCAP rating.¹⁸² The Australian Capital Territory government has updated their fleet purchasing guidelines to include a requirement for all light passenger vehicles to have a minimum five-

¹⁷⁹ National Transport Commission, 2018, *Review of Regulatory Telematics*, Report, [https://www.ntc.gov.au/Media/Reports/\(58FFC40D-7F0C-C889-F83E-107C3BE07825\).pdf](https://www.ntc.gov.au/Media/Reports/(58FFC40D-7F0C-C889-F83E-107C3BE07825).pdf), p. 37.

¹⁸⁰ Australian Transport Council, 2011, *National Road Safety Strategy 2011-2020*, http://roadsafety.gov.au/nrss/files/NRSS_2011_2020.pdf, p. 76.

¹⁸¹ Government of South Australia, 2011, *South Australia's Road Safety Strategy 2020 – Action Plan 2011-2012*, https://www.dpti.sa.gov.au/_data/assets/pdf_file/0020/125822/SA_Road_Safety_Strategy_2020_-_Action_Plan.pdf.

¹⁸² Australian Capital Territory Government, 2016, *Road Safety Action Plan 2016-2020*, http://cdn.justice.act.gov.au/resources/uploads/JACS/Road_Safety/PDFs/151571_ACT_Road_Safety_Action_Plan_FA_Web.pdf, p. 54.

star ANCAP rating and for all commercial vehicles to have a minimum four-star ANCAP rating.¹⁸³

From 2018, the Victorian government will require its car fleet to have the best safety features available as part of its overall purchasing policy.¹⁸⁴ The Victorian government will also influence private transport and heavy vehicle companies to purchase or lease vehicles with advanced safety features, such as ESC, LDWS and AEB.¹⁸⁵

In Western Australia, the 2008-2020 road safety strategy states that government can take on a lead role in setting an example to the rest of the community, as well as influencing vehicle manufacturers and importers to take-up safer vehicles.¹⁸⁶ The strategy outlines that ESC should be fitted to all new corporate and government-purchased vehicles, ideally across all three levels of government.¹⁸⁷ The strategy also recommends the installation of ISA devices in government and fleet vehicles, which will reduce inadvertent speeding.¹⁸⁸

In Tasmania, the government has committed to improving the star rating of Tasmania's vehicle fleet by ensuring high minimum safety specifications for all new passenger and light commercial vehicles in the Tasmanian government fleet.¹⁸⁹

In the Northern Territory, the Road Safety Action Plan 2018-22 states that the Northern Territory Government Fleet policy will promote the purchase of ANCAP five-star fleet vehicles.¹⁹⁰ The Road Safety Action Plan 2018-22 recognises that this action will result in safer vehicles entering the second-hand market.¹⁹¹

In New South Wales, the Road Safety Plan 2021 states that the New South Wales government will update their policies so as many New South Wales government fleet vehicles as possible have the latest and proven safety technologies, and explore options to ensure government contractor vehicles meet the same standard.¹⁹² In addition, the New South Wales government has committed to partner with the heavy vehicle industry to increase safety features in the fleet, such as blind spot monitoring and under run protection, as well as enhancing the integration of fleet safety into heavy vehicle access policy.¹⁹³

Roads and Maritime Services has developed the Safety, Productivity & Environment Construction Transport Scheme (SPECTS) to enable the efficient movement of construction materials in the greater Newcastle-Sydney-Wollongong area.¹⁹⁴ SPECTS allows enrolled trucks carrying more materials greater road access in return for meeting higher environmental, safety and compliance standards. All enrolled vehicles must be equipped

¹⁸³ Ibid.

¹⁸⁴ Victoria State Government, 2016, *Towards Zero 2016-2010 Victoria's Road Safety Strategy & Action Plan*, https://www.towardszero.vic.gov.au/_data/assets/pdf_file/0010/183556/STU_0206_RS_STRATEGY_2016_web.pdf, p. 24

¹⁸⁵ Ibid.

¹⁸⁶ Western Australia, 2009, *Road Safety Strategy to reduce road trauma in Western Australia 2008-2020*, <https://www.rsc.wa.gov.au/RSC/media/Documents/About%20Us/Towards%20Zero/towards-zero-strategy.pdf>, p. 43.

¹⁸⁷ Ibid.

¹⁸⁸ Ibid.

¹⁸⁹ Tasmanian Government, 2017, *Towards Zero Action Plan 2017-2019*, https://www.towardszero.tas.gov.au/_data/assets/pdf_file/0003/142617/TOWARDS_ZERO_ACTION_PLAN_2017_-_2019.pdf, p. 9.

¹⁹⁰ Northern Territory Government, 2018, *Road Safety Action Plan 2018-22*, https://roadsafety.nt.gov.au/_data/assets/pdf_file/0007/466675/Towards-Zero-Action-Plan-v18.1.pdf, p. 22.

¹⁹¹ Ibid.

¹⁹² New South Wales Government, 2018, *Road Safety Plan 2021*, <http://www.towardszero.nsw.gov.au/sites/default/files/2018-02/road-safety-plan.pdf>, p. 21.

¹⁹³ Ibid.

¹⁹⁴ Roads and Maritime Services, 2018, *Safety, Productivity & Environment Construction Transport Scheme (SPECTS)*, <http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/schemes-programs/spects.html>.

with an IAP in-vehicle unit to enable satellite-based tracking and must be fitted with OBM measurement devices linked to IAP.

During the NSW Inquiry, Toll Group commented that government departments could use their contracting power to improve the age of the heavy vehicle fleet.¹⁹⁵ For example, transport operators could not obtain a contract for WestConnex without having an average heavy vehicle fleet age of four or five years.¹⁹⁶

4.9 Heavy vehicle safety technology and telematics trials

Accelerated adoption and use of safety technologies may be achieved through collaborative trials with industry, to communicate and demonstrate the benefits of such technology and address any perceived barriers to uptake. By providing industry with the opportunity to try the technology on a trial basis this will promote the productivity and safety benefits, provide feedback to the technology providers and ultimately increase knowledge, interest and buy-in for the future.

Transport for NSW is currently exploring an opportunity for New South Wales to develop and implement a trial for a new approach to managing vulnerable assets using telematics. Transport for NSW recently ran a co-design workshop with a diverse group of stakeholders including government, the road transport industry, transport operators, technology service providers and regulatory bodies. The co-design session discussed the challenges with the current approach and explored the opportunities and outcomes a new approach presents. Transport for NSW will continue progressing the details for a pilot program through the co-design process with government, industry, regulatory bodies and service providers. The outcomes and findings from the Transport for NSW trial could then be fed into the National Transport Commission's broader telematics reforms.

¹⁹⁵ New South Wales Parliament Joint Standing Committee on Road Safety, 2018, *Report on proceedings before Staysafe Inquiry into heavy vehicle safety and the use of technology to improve road safety*, Parliament of New South Wales, <https://www.parliament.nsw.gov.au/ladocs/transcripts/285/Corrected%20%20Transcript%20-%209%20April%202018.pdf>, p. 35.

¹⁹⁶Ibid, p. 35.

Appendix A Types of data collected by telematics applications

The Telematics Data Dictionary describes the data elements used within TCA's *National Telematics Framework* by setting a common understanding of their data types, formats and definitions.¹⁹⁷

A telematics application consists of different data elements, which when collected and combined, enable data records to be generated.

Figure 16. Broad groupings of data elements currently available through TCA's *National Telematics Framework*¹⁹⁸

	Date and Time Data	GPS Data	
Application Data	<ul style="list-style-type: none"> Date Time 	<ul style="list-style-type: none"> Direction of Travel Horizontal Dilution of Precision Latitude Longitude Satellite Count 	Object Data
<ul style="list-style-type: none"> Application Usage Application Non-Usage Application Alarm Code Application Log On Method 	Device Data		<ul style="list-style-type: none"> Object Description Object ID Object Name
Authorised Officer Data	<ul style="list-style-type: none"> Device Count Device Hardware Version Device ID Device Sequence Number Device Software Version Movement Sensor Status Terminal ID 	Hire and Engagement Data	Organisational Data
<ul style="list-style-type: none"> Authorised Officer ID Days Driver Data Records Requested 		<ul style="list-style-type: none"> Hire Status Price Component Price ID Price Total Vehicle Engagement 	<ul style="list-style-type: none"> Name Street Address Telephone Web Address
Axle Data	Distance Data		Speed Data
<ul style="list-style-type: none"> Axle Count Axle Group Count Lift Axle Status 	<ul style="list-style-type: none"> Distance Travelled Odometer Reading 	Jurisdiction Data	<ul style="list-style-type: none"> Speed Threshold Vehicle Speed
Breath Sample Data	Driver Data		Record Data
<ul style="list-style-type: none"> Breath Alcohol Concentration Breath Sample Flow Rate Breath Sample Flow Volume Breath Sample Duration Breath Test Result Breath Test Type 	<ul style="list-style-type: none"> Driver ID Driver Licence Number Fit for Work Status Name 	Location Data	<ul style="list-style-type: none"> Specification Reference Record Number Record Type
Comment Data	Event Data		Record Data
<ul style="list-style-type: none"> Comment Code Comment Name Comment Text 	<ul style="list-style-type: none"> Event Code Event Description Event Name Event Severity 	Mass Data	<ul style="list-style-type: none"> Ignition Switch Status Vehicle Category Code Vehicle Category Name Vehicle Identification Number Vehicle Interlock Status Vehicle Registration Jurisdiction Vehicle Registration Number
	Fatigue Management Data		
	<ul style="list-style-type: none"> Work Diary Number Work Hours Option Work Rest Status Two-up Driver Status 	<ul style="list-style-type: none"> Axle Group Mass Axle Group Mass Quality Gross Vehicle Mass Load Status Mass Sensor Unit Count Mass Sensor Unit Sequence Number Mass Status Self-Declared Mass 	

¹⁹⁷ Transport Certification Australia, 2018, *National Telematics Framework Data Dictionary*, <https://tca.gov.au/component/joomdoc/Publications/NationalTelematicsFramework-TelematicsDataDictionary.pdf/detail>.

¹⁹⁸ Transport Certification Australia, 2018, *National Telematics Framework Application Builder*, <https://tca.gov.au/component/joomdoc/Publications/NationalTelematicsFramework-ApplicationBuilder.pdf/detail>, p. 12.

The following table describes the data elements used within TCA's *National Telematics Framework* data dictionary.¹⁹⁹

Table 1. Data elements and description from TCA's Data Dictionary

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Alarm Code	Numeric code assigned to a class of status change or event of interest	Integer	0	99		Alarm Code allocation is specific to the National Telematics Framework
Application Usage	Consumer operating under a specific application that requires the consumer to declare if the consumer is using the application	Enumerated	—	—		
Authorised Officer ID	Unique identification of an officer authorised to perform an authorised activity	String	0	30		Example: badge number
Axle Count	Total number of axles present within an axle group or vehicle (as per context)	Integer	0	99		0 = Count is unknown or not applicable
Axle Group Count	Total number of axle groups present within a vehicle	Integer	0	99		0 = Count is unknown or not applicable
Axle Group Mass	Mass of an axle group	Integer	0	99999	kilograms	Resolution: 10 kilograms or better
Breath Alcohol Concentration	Mass concentration of ethanol in a breath sample	Decimal	0.000	9.999	grams of alcohol per 210 litres of exhaled breath	Blood Alcohol Concentration (BAC) is derived from Breath Alcohol Concentration (BrAC). Using a blood-breath ratio of 2100:1, BrAC in g/210 L is equivalent to %BAC.

¹⁹⁹ Transport Certification Australia, 2018, *National Telematics Framework Data Dictionary*, <https://tca.gov.au/component/joomdoc/Publications/NationalTelematicsFramework-TelematicsDataDictionary.pdf/detail>.

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Breath Sample Flow Rate	Flow rate of a breath sample	Decimal	0.00	9.99	litres per second of exhaled breath	Decimals: 2
Breath Sample Flow Volume	Flow volume of a breath sample	Decimal	0.00	9.99	litres of exhaled breath	Decimals: 2
Breath Sample Duration	Duration of a breath sample in seconds	Decimal	0.0	99.9		Decimals: 1
Breath Test Result	Result of a breath test	Enumerated	—	—		Values: 0 = Pass; 1 = Fail
Breath Test Type	Designation of whether a breath test is an initial or random test	Enumerated	—	—		Values: 0 = Initial; 2 = Random; 3 = Subsequent Random
Comment Code	Numeric code to identify a predefined Comment Name	Integer	0	9999		Comment Code allocation is specific to the National Telematics Framework
Comment Name	Human-readable representation of a predefined Comment Code	String	0	100		Comment Name content is specific to the National Telematics Framework
Comment Text	Manually entered, free-form text recording a comment	String	0	256		
Days Driver Data Records Requested	Number of days of driver data requested by an authorised officer when viewing telematics data	Integer	0	999		
Device Count	Total number of devices connected to a single device	Integer	0	99		

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Device Hardware Version	Version of the device hardware	String	1	6		Format is manufacturer defined
Device ID	Unique identifier of a device, that identifies it and the records generated by it	String	10	20		
Device Sequence Number	Relative position of a device on a vehicle, sequentially incrementing from the front to the back of the vehicle, starting at 1	Integer	1	99		
Device Software Version	Version of the telematics device software	String	1	6		Format is manufacturer defined
Direction of Travel	Course or heading of a device that moves expressed in two dimensions as the angle between true north and an imaginary line through the main fore-and-aft axis of the device	Decimal	0.0	359.9	degrees	Decimals: 1
Distance Travelled	Total traversed distance between a start and end point established by change in odometer or from multiple GNSS measurements	Decimal	0.0	999999.9	kilometres	Decimals: 1
Driver ID	Unique identifier assigned to a driver	Integer	0	18		
Driver Licence Number	Formal identification of a driver issued by the relevant authority for a Jurisdiction	String	6	13		Combination of Driver Licence Number and Jurisdiction is a unique identifier for a licensed individual
Event Code	Unique code describing an event	String	1	99		Event Code allocation is specific to the National Telematics Framework

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Event Description	Description of a specific event	String	1	999		Event Description is specific to the National Telematics Framework
Event Name	Short name describing an event	String	1	99		Example: Road Closure
Event Severity	Severity of an event	Enumerated	—	—		Values: Advisory; Low; Routine; High; Emergency
Fit for Work Status	Declaration by a driver of whether they are fit for work or not	Enumerated	—	—		Values: 0 = Unfit for work; 1 = Fit for work
Gross Vehicle Mass	Total vehicle mass	Integer	0	999999	kilograms	Resolution: 10 kilograms or better
Hire Status	Status of whether a vehicle is hired, not hired or paused	Enumerated	—	—		Values: 1 = Hire off; 2 = Hire on; 3 = Hire pause
Horizontal Dilution of Precision	Measure quantifying the quality of the determination of horizontal position (latitude and longitude) based on the number and geometric distribution of the satellites used in the determination	Decimal	0.0	99.9		Unknown or undetermined HDOP reading (e.g. no satellites) should use a value of 99.9 rather than zero to avoid confusion with ideal HDOP measurements Decimals: 1
Ignition Switch Status	Status of a vehicle ignition switch	Enumerated	—	—		Values: 0 = Disconnected; 1 = Off; 2 = On
Issuing Authority	Entity that has operational responsibility by the relevant authority	String	1	255		

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Jurisdiction	Geographical area containing a road network (i.e. typically an Australian state or territory)	Enumerated	—	—		Values: VIC; NSW; QLD; SA; WA; NT; TAS; ACT
Latitude	Angular distance on a meridian north or south of the equator	Decimal	-90.00000	+90.00000	degrees	Relative to the datum GDA94 Decimals: 5
Lift Axle Status	Position of a lift axle as part of an axle group	Enumerated	—	—		Values: <ul style="list-style-type: none"> • 0 = Axle Group does not include a lift axle, or is not capable of determining lift axle position; • 1 = Axle Group includes a lift axle, but the position is currently unknown; • 2 = Axle Group includes a lift axle, and the lift axle is detected as raised; • 3 = Axle Group includes a lift axle, and the lift axle is detected as lowered
Load Status	Indication of whether a vehicle is loaded or not	Enumerated	—	—		Values: N = No load; L = Load
Locality	Name of an Australian suburb (in a city or larger town) or locality (outside a city or larger town)	String	1	255		Name must be officially recognised by the Committee for Geographical Names in Australasia (CGNA), under the Intergovernmental Committee on Surveying and Mapping (ICSM)

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Log On Method	Method by which a consumer logs on	Enumerated	—	—		Values: 0 = Automatically entered; 1 = Manually entered
Longitude	Angular distance east or west from Greenwich meridian	Decimal	-180.00000	+180.00000	degrees	Relative to the datum GDA94 Decimals: 5
Movement Sensor Status	Status of a sensor which detects movement of a vehicle independent of GNSS signal and ignition status	Enumerated	—	—		Values: 0 = Disconnected; 1 = No movement; 2 = Movement
Name	Name of a person, organisation or other entity	String	1	255		
Non-Application Usage	Consumer operating under a specific application that requires the consumer to declare if the consumer is not using the application	Integer	0	1		
Object Description	Description of an Object	String	1	999		
Object ID	Unique identifier of a named Object	String	1	999		Specific identifiers must be used where an authority has defined identifiers for specific Objects.
Object Name	Name of an Object	String	1	255		
Odometer Reading	Odometer reading of a vehicle	Decimal	0.0	9999999.9	kilometres	Decimals: 1
Postcode	Australian postcode	String	4	4		Pattern: [0-9]{4}

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Price Component	Component value that forms part of a price	Decimal	00000.00	99999.99	Australian dollars and cents	Examples: Metered fare; Fixed fare Decimals: 2
Price ID	Unique identifier of a price	String	1	5		
Price Total	Total value of a price	Decimal	00000.00	99999.99	Australian dollars and cents	Example: Schedule of taxi fares Decimals: 2
Radius	Location of an Object or Event, described as a circle centred at a given latitude and longitude	Integer	1	999999	metres	
Record Number	Value assigned to data records in order of generation	Integer	0	9999999999		At a minimum, Record Numbers should be generated from the same sequence for the same Record Type, noting that the preference is for a single sequence for all Record Types. Additionally, different applications within the National Telematics Framework may require specific functionality.
Record Type	Code identifying the type of data record	Integer	0	99		Record Type allocation is specific to a telematics application
Satellite Count	Number of satellites used to establish a measurement made by a GNSS receiver	Integer	0	99		
Self-Declared Mass	Self-declared gross vehicle mass	Decimal	0.0	999.9	metric tonnes	Decimals: 1

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
Specification Reference	Version of the application specification	String	0	10		Format derived from application
Speed	Speed at which a vehicle is travelling	Decimal	0.0	999.9	kilometres per hour	Decimals: 1
State or Territory	Australian state or territory	Enumerated	—	—		Values: VIC; NSW; QLD; SA; WA; NT; TAS; ACT
Street Address	Street address describing the registered location of an organisation or individual	String	1	255		Formed in accordance with Australia Post address presentation standards (AS4212-1994)
Telephone	Telephone number of an organisation or an individual	String	1	20		
Two-up Driver Status	Indication of whether the driver is performing solo work or partnering with another driver	Enumerated	—	—		Values: 0 = Solo driver; 1 = Two-up driver
Vehicle Category Code	Numeric code to identify a predefined Vehicle Category	Integer	0	99		Vehicle Category Code allocation is specific to the National Telematics Framework
Vehicle Category Name	Human-readable representation of a predefined Vehicle Category	String	1	100		Vehicle Category Name is specific to the National Telematics Framework
Vehicle Engagement	For a hire vehicle, status of customer engagement with the vehicle	Enumerated	—	—		Values: 1 = Rank; 2 = Hail; 3 = Booking
Vehicle Identification Number	Unique code, including a serial number, used by the automotive industry to identify a vehicle	String	17	17		Often abbreviated as VIN

Data Element	Description	Data Type	Value or Length		Units	Remarks
			Minimum	Maximum		
						Pattern: [A-HJ-NPR-Z0-9]{17}
Vehicle Interlock Status	Status of a vehicle interlock function where the ignition of an engine is either prevented from starting or not	Enumerated	—	—		Values: 1 = Blocked; 2 = Unblocked
Vehicle Registration Jurisdiction	Unique identifier for the Jurisdiction where a Vehicle Registration was issued by the relevant authority	Enumerated	—	—		Values: VIC; NSW; QLD; SA; WA; NT; TAS; ACT; FIRS
Vehicle Registration Number	Formal identification of a Vehicle Registration issued by the relevant authority for a Jurisdiction to a distinct vehicle	String	6	10		Combination of Vehicle Registration Number and Vehicle Registration Jurisdiction is a unique identifier for a registered vehicle
Web Address	A URL, specified in standard format, that locates a specific resource on the Internet or an intranet	String	1	255		Consists of an Internet protocol name; a domain name; and optionally other elements such as a port, directory, and file name
Work Hours Option	Work hours option under which a driver is operating, defining associated rules and limits on work and rest periods	String	1	10		Populated with a code representing the work hours option, including Standard Hours, Advanced Fatigue Management (AFM), Basic Fatigue Management (BFM) and other fatigue management schemes (including exemptions)
Work Rest Status	Indication of whether a driver is beginning a work or rest period	Enumerated	—	—		Values: 0 = Rest; 1 = Work

A.1 Data elements used in TCA's telematics applications

Table 2. Data elements used in TCA's telematics applications

Data elements	Intelligent Access Program (IAP)	Intelligent Speed Compliance (ISC)	Intelligent Speed Management (ISM)	On-Board Mass (OBM)	Road Infrastructure Management (RIM) application	Alcohol Interlocks
Application Data						
Application Alarm Data	✓	✓		✓		
Axle Data						
Axle Count				✓	If needed	
Axle Group Count				✓	If needed	
Lift Axle Status				✓		
Breath Sample Data						
Breath Alcohol Concentration						✓
Breath Sample Flow Rate						✓
Breath Sample Flow Volume						✓
Breath Sample Duration						✓

Data elements	Intelligent Access Program (IAP)	Intelligent Speed Compliance (ISC)	Intelligent Speed Management (ISM)	On-Board Mass (OBM)	Road Infrastructure Management (RIM) application	Alcohol Interlocks
Breath Test Result						✓
Breath Test Type						✓
Comment Data						
Comment Code	✓					
Comment Name	✓					
Comment Text	✓					
Date and Time Data						
Date	✓	✓	✓	✓	✓	✓
Time	✓	✓	✓	✓	✓	✓
Device Data						
Device Count				✓		
Device Hardware Version	✓	✓		✓		✓

Data elements	Intelligent Access Program (IAP)	Intelligent Speed Compliance (ISC)	Intelligent Speed Management (ISM)	On-Board Mass (OBM)	Road Infrastructure Management (RIM) application	Alcohol Interlocks
Device Sequence Number				✓		
Device Software Version	✓	✓		✓		✓
Device ID	✓	✓	✓	✓	✓	✓
Movement Sensor Status	✓	✓		✓		✓
Terminal ID	✓					✓
Driver Data						
Driver ID						✓
GPS Data						
Direction of Travel	✓	✓	✓	✓		
Horizontal Dilution of Precision	✓	✓	✓	✓		
Latitude	✓	✓	✓	✓		
Longitude	✓	✓	✓	✓		

Data elements	Intelligent Access Program (IAP)	Intelligent Speed Compliance (ISC)	Intelligent Speed Management (ISM)	On-Board Mass (OBM)	Road Infrastructure Management (RIM) application	Alcohol Interlocks
Satellite Count	✓	✓	✓	✓		
Jurisdiction Data						
Issuing Authority	✓	✓		✓		✓
Jurisdiction	✓	✓		✓		✓
Mass Data						
Axle Group Mass				✓	If needed	
Axle Group Mass Quality				✓		
Gross Vehicle Mass				✓	If needed	
Load Status				✓		
Mass Sensor Unit Count				✓		
Mass Sensor Unit Sequence Number				✓		
Mass Status				✓		

Data elements	Intelligent Access Program (IAP)	Intelligent Speed Compliance (ISC)	Intelligent Speed Management (ISM)	On-Board Mass (OBM)	Road Infrastructure Management (RIM) application	Alcohol Interlocks
Self-Declared Mass	✓				If needed	
Record Data						
Record Number	✓	✓	✓	✓	✓	✓
Speed Data						
Speed Threshold		✓	✓			
Vehicle Speed		✓	✓			
Vehicle Data						
Ignition Switch Status	✓			✓		✓
Vehicle Category Code	✓			✓	If needed	
Vehicle Category Name	✓			✓	If needed	
Vehicle Identification Number	✓	✓		✓		✓
Vehicle Interlock Status						✓

Data elements	Intelligent Access Program (IAP)	Intelligent Speed Compliance (ISC)	Intelligent Speed Management (ISM)	On-Board Mass (OBM)	Road Infrastructure Management (RIM) application	Alcohol Interlocks
Vehicle Registration Jurisdiction	✓	✓		✓		✓
Vehicle Registration Number	✓	✓		✓		✓

Appendix B Glossary

Term	Definition
ADR	Australian Design Rules
AEB	Autonomous Emergency Braking
ANCAP	Australasian New Car Assessment Program
BITRE	Bureau of Infrastructure, Transport and Regional Economics
EBA	Emergency Brake Assist
ECU	Electronic Control Unit
EEG	Electroencephalography
ELD	Electronic Logging Device
ESC	Electronic Stability Control
EWD	Electronic Work Diary
FCWS	Forward Collision Warning Systems
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
HVNL	Heavy Vehicle National Law
IAP	Intelligent Access Program
IoT	Internet of Things
ISA	Intelligent Speed Assistance
ISC	Intelligent Speed Compliance
IVU	In-Vehicle Unit
LDWS	Lane Departure Warning Systems
MSU	Mass Sensor Unit
NHTSA	National Highway Traffic Safety Administration

NHVR	National Heavy Vehicle Regulator
NSW Inquiry	NSW Inquiry into heavy vehicle safety and use of technology to improve road safety
NTI	National Transport Insurance
OBM	On-Board Mass
RSC	Roll Stability Control
SD	Self-Declaration
SDID	Self-Declaration Input Device
SPECTS	Safety, Productivity and Environment Construction Transport Scheme
TCA	Transport Certification Australia
TIV	TRUCKRIGHT Industry Vehicle
UNECE	United Nations Economic Commission for Europe

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